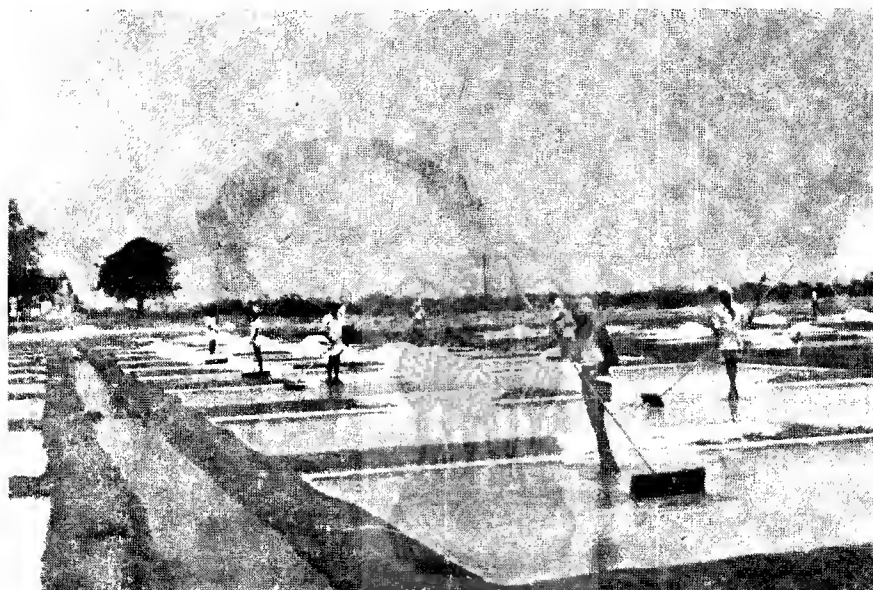


REPORT  
OF  
THE WORKING GROUP  
ON  
SALT INDUSTRY



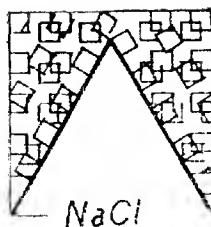
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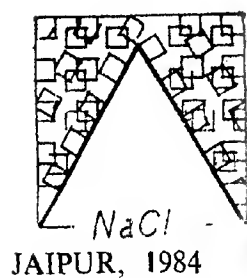
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GOVT. OF INDIA  
SALT COMMISSIONER  
MINISTRY OF INDUSTRY



JAIPUR, 1984

# REPORT OF THE WORKING GROUP ON SALT INDUSTRY



SALT COMMISSIONER  
GOVERNMENT OF INDIA  
MINISTRY OF INDUSTRY

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## CHAPTER I

### INTRODUCTION

#### 1.1 APPOINTMENT OF THE WORKING GROUP

The Working Group was constituted by the Government of India, Ministry of Industry (Department of Industrial Development) in their O.M. No. 07013/1/83-Salt, dated 4th June, 5th July and 12th August, 1983 (vide Annexures-I, II-A & II-B) with the following personnel :—

- |  |          |
|--|----------|
| 1. Shri P. Subramanian<br>Salt Commissioner<br>Jaipur  | Chairman |
| 2. Shri J. S. Matharu<br>Industrial Adviser<br>D.G.T.D., New Delhi   | Member   |
| 3. Prof. M. M. Taqui Khan<br>Director<br>CSMCRI, Bhavnagar   | Member   |
| 4. Shri K. K. Shukla<br>Chairman-cum-Managing Director<br>HSL/SSL, Jaipur  | Member   |
| 5. Shri R. V. Ramani<br>Managing Director<br>Mettur Chemicals & Industrial<br>Corporation<br>Madras  | Member   |
| 6. Shri D. S. Seth<br>Chairman & Managing Director<br>M/s. Tata Chemicals Limited<br>Bombay  | Member   |
| 7. Shri N. H. Kotecha<br>President<br>Kutch Saurashtra Salt Manufacturers'<br>Association<br>M/s. Halar Salt & Chemicals Works<br>Jamnagar | Member   |
| 8. Shri M. G. Venkatesh Mannar<br>Managing Director<br>Marthi Crystal Salt Co.,<br>Madras  | Member   |
| 9. Shri R. Nandakumar<br>Secretary<br>Andhra Pradesh Salt Producers'<br>Association<br>Visakhapatnam                                       | Member   |
| 10. Shri Vajubhai Mehta<br>President<br>Gujarat Rajya Mith Utpadak<br>Sahakari Sangh Limited<br>Surendranagar (Gujarat)                    | Member   |
| 11. Shri M. S. Selvarajan<br>President<br>Arumuganeri Salt Production &<br>Sales Co-op. Society<br>Arumuganeri (Tamil Nadu)                | Member   |

- |  |        |
|--|--------|
| 12. Shri T. K. Kamilla<br>Director<br>Ministry of Health & Family<br>Welfare<br>(Department of Health)<br>New Delhi                | Member |
| 13. Dr. K. Aghoramurthy<br>Adviser (Chemicals)<br>Ministry of Chemicals & Fertilisers<br>(Department of Chemicals)<br>New Delhi    | Member |
| 14. Shri O. P. Sharma<br>Under Secretary<br>Ministry of Industry<br>Department of Industrial Develop-<br>ment, New Delhi           | Member |
| 15. Shri Onkar Sharan Mehrotra<br>Director<br>Hindustan Salts Limited<br>6, Ojha Street,<br>Kashipur, (U.P.)                       | Member |
| 16. Shri K. S. Krishnamurthy<br>Deputy Technical Adviser<br>Ministry of Food & Civil Supplies<br>(Department of Food)<br>New Delhi | Member |
| 17. Shri R. K. Tangri<br>Joint Director<br>Railway Board<br>New Delhi  | Member |
| 18. Representative of Shipping &<br>Transport Ministry<br>New Delhi  | Member |

#### 1.2. TERMS OF REFERENCE

1.2.1. The Working Group was set up to advise the Government on the measures necessary to place the Salt Industry in India on sound footing based on the latest scientific technology. The Working Group shall undertake a study of the technology presently adopted for salt manufacture in different states, existing standard of salt produced vis-a-vis those prescribed under PFA Act, 1954 and Rules made thereunder and the training facilities presently available; and shall suggest time-bound measures for :—

- (a) effecting improvements in technology that are feasible in different salt producing states;
- (b) bringing about improvements in quality of salt produced, keeping in view the prescribed standard for edible consumption and the specific requirements of chemical industries; and

- (c) type of training that is required to be imparted to salt workers for adopting the improvement in technology and standard of salt as indicated at (a) and (b) above.

1.2.2. Subsequently, the terms of reference were enlarged to include the following matters vide Ministry of Industry (Department of Industrial Development) O.M. No. 07013/1/83-Salt, dated the 12th August, 1983 (Annexure-II-B) :—

- (i) marketing and distribution of salt; and
- (ii) manufacture of adequate quantities of iodised salt required for Goitre endemic areas of the country and of iron fortified salt for the iron deficient population and its distribution.

### 1.3 PREVIOUS STUDIES AND ENQUIRIES

Most of the studies and enquiries made prior to Independence on the subject of salt relate to, or constrained by the considerations of revenue, fiscal and administrative policies of the Government and therefore have no relevance for the present. Many important and far-reaching developments have taken place in Salt Industry in the country since partition which left India deficient in Salt with the loss of important Salt Sources like Khewda mines and Salt Works in Sind to Pakistan. Determined policy of the National Government to abolish the obnoxious duty on salt with attending equally strict controls on production and transport of salt has helped the country to tide over the immediate crisis and made available salt at reasonable price. Different committees were set up to advise the Government on various aspects of Salt Industry in the country from time to time. Soon after Independence, acute shortage of salt was felt especially in the up country. An Inter-Departmental Committee under the Chairmanship of Shri H. M. Patel, the then Cabinet Secretary, submitted an interim report in August, 1947 on the measures to be taken to tide over the prevailing crisis of shortage of salt and subsequently came up with several recommendations one of which was to set up a Committee of experts to make a thorough study of all aspects connected with the Salt Industry. The Salt Experts Committee (1948-50) thus constituted under the Chairmanship of Shri P. A. Narielwala conducted perhaps the most exhaustive and thorough studies so far made on Salt Industry in India and its report continues to be a reference manual even today. As a result of acceptance of many of the recommendations of the Committee by the Government, the country is made self-sufficient in production of salt and the industry is made conscious of the quality of the produce. Salt Department itself had a physical metamorphosis with radical change of its functions from a preventive and controlling department for collection of revenue to a department geared up so develop the Industry on scientific lines to serve the ever growing demands of salt for edible and industrial purposes. Subsequent committees mainly dealt with implementation of specific measures recommended by the Salt Experts Committee. A High Level Salt Enquiry Committee was constituted in 1978 to advise the Government of the changes required in the existing administrative set up for manufacture and distribution of salt and collection and utilisation of

Salt Cess Proceeds and any other matter relating thereon in changed circumstances of phenomenal growth of the industry, conflicting interests of different categories of salt manufacture and of different states of the Union and aspiration of the industry and its labour. The Government accepted most of the recommendations which are general in nature and initiated action to implement them. The present Working Group was constituted as a follow up action with specific terms of reference.

### 1.4 MEETING OF THE WORKING GROUP

1.4.1 The Working Group met at New Delhi on the 22nd and 23rd July, 1983 at Udyog Bhawan, New Delhi and considered the subjects relating to improvements in technology of salt manufacture, Quality Control and Training. The meeting was inaugurated by Shri N. D. Tiwari, Hon'ble Union Minister for Industry. In his inaugural address (copy of the address enclosed in Annexure-III) he stressed the importance of the improvement in technology adopted for salt manufacture, production of quality salt as prescribed under the PFA Act in the interest of public health and the growing needs of high grade salt for use in Chlor-Alkali Industries. He exhorted the need for drawing up of a time-bound programme to achieve these objectives and to implement them.

1.4.2 The Working Group was also addressed by Sri S. M. Krishna, the then Hon'ble Minister for State for Industry and he referred particularly to the problems of labour employed in the Salt Industry and the need for increasing the manufacture of iodised salt, iron fortified salt etc. The second session of the Working Group was held on the 27th and 28th October, 1983 at New Delhi and deliberated on the marketing and distribution of salt and the manufacture of iodised salt and iron fortified salt.

1.4.3 Shri S. B. Jain, Additional Secretary, Ministry of Industry (Department of Industrial Development), who participated in the second session stressed the importance of improving working conditions of the labour employed in the Salt Industry by providing the workers with the basic amenities like drinking water, shelter and medical facilities. He also emphasised the need to modernise the tools used in the Industry.

### 1.5 PREPARATION OF THE REPORT

A draft report of the Working Group was circulated amongst all the members of their comments and suggestion. All the members accepted the recommendations incorporated in the draft report with a few changes or modifications. The report was re-drafted to incorporate additional information to give the basis for the recommendations made on the suggestions received. The final report as presented has incorporated the suggestions made and consists of eight chapters. The first Chapter deals with constitution of the Working Group, its terms of reference and the mode of its working. The second Chapter is devoted to a brief review of the Salt Industry. The third Chapter describes the technology of salt manufacture and the various steps to be taken to modernise the industry by adopting latest technology.

Quality Control to be enforced to improve the various grades of salt manufactured in the country is described in Chapter-IV. Chapter-V deals with the training needs of the workers technicians and professionals. The various aspects of marketing and distribution of salt in India are examined in Chapter-VI. Recent medical studies reveal the importance of the use of iodised and iron fortified salt in the eradication of endemic goitre and anaemia. The various steps to be taken for increasing the production of iodised salt and iron fortified salt are described in Chapter-VII. Conclusions and recommendations of the Working Group are given in Chapter-VIII.

#### 1.6 ACKNOWLEDGEMENT

The Working Group acknowledges with gratitude the assistance it derived from the available literature on salt and wealth of statistical data made available by the Salt Department and other Government agencies and individual members of the Group. The Working Group would also like to place on record its appreciation for the assistance and co-operation extended by the Salt Department, Government of India in the preparation of the agenda papers for the meetings and the draft report.

Sd/-  
(J. S. Matharu)  
Member  
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(K. K. Shukla)  
Member  
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(D. S. Seth)  
Member  
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(M. G. Venkatesh Maninar)  
Member  
Sd/-  
(Vajubhai Mehta)  
Member  
Sd/-  
(T. K. Kamilla)  
Member  
Sd/-  
(O. P. Sharma)  
Member  
Sd/-  
(K. S. Krishnamurthy)  
Member

(P. Subramanian)  
Chairman  
Sd/-  
(M.M. Taqui Khan)  
Member  
Sd/-  
(R. V. Ramani)  
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(O. S. Mehrotra)  
Member  
Sd/-  
(R. K. Tangri)  
Member



सत्यमेव जयते

## CHAPTER—II

### 2. BRIEF REVIEW OF SALT INDUSTRY

2.1 Common salt is one of the important minerals in the world. The main sources of salt are sea, inland salt lakes, rock salt deposits and sub-soil brine. Depending upon the sources, different manufacturing techniques have been developed and adopted over centuries to win the salt. Till the end of 19th century, salt was recognised only as an article of daily necessity for human consumption. However, with the advent of industrial revolution it is found to have enormous uses in various fields. Salt has become an important raw-material in the Chemical Industries viz. Caustic Soda, Soda ash, Chlorine, etc. The demand for salt is increasing every year in the world.

2.2 The Salt Industry experienced dynamic growth during the last two decades. The annual production of salt in the world had increased from 85 million tonnes in 1960 to 141 million tonnes in 1970 and now it is reaching 200 million tonnes. The leading salt producing countries in the world with approximate annual production are given below :—

	(In million tonnes)
U.S.A. . . . .	43
China . . . . .	30
U.S.S.R. . . . .	15
Federal Republic of Germany . . . . .	15
United Kingdom . . . . .	8
India . . . . .	7.5 (maximum production touched is 8.9)

India occupies the sixth position in the production of salt in the world. When India attained Independence in 1947, salt was being imported from the United Kingdom & Aden. However, due to various steps taken by the Government, self-sufficiency was achieved in 1952 and the salt production increased from 1.9 million tonnes in 1947 to 8.9 million tonnes in 1981, the highest production so far achieved. The five fold increase in salt production is mainly due to :—

- (i) Increase in the area under salt manufacture from 51,495 acres in 1947 to 4,62,194 acres in 1983;
- (ii) Increased utilisation of sub-soil brine in Gujarat and Tuticorin;

(iii) Concessions granted to the Small Scale Salt Manufacturers under 10 acre holdings;

(iv) Increased demand of salt by Chlor-Alkali Industry.

The details of production of salt since 1947 are given in Annexure-IV.

#### 2.3 SOURCES OF SALT :

The main sources of salt in India are :—

- (i) Sea Brine;
- (ii) Lake Brine;
- (iii) Sub-soil Brine; and
- (iv) Rock Salt Deposits.

2.3.1 Sea water is an inexhaustible source of salt. Salt production along the coast is limited by weather and soil conditions. The principal salt producing centres are :—

- (a) Marine salt works along the coast of Gujarat (Jamnagar, Mithapur, Bhavanagar, Gandhidham), Maharashtra, Tamil Nadu, (Tuticorin, Vedaranyam, Covelong), Andhra Pradesh (Chinnaganjam, Kakinada and Naupada), Orissa (Sumadi, Ganjam) and West Bengal (Contai).
- (b) Inland Salt works in Rajasthan using lake, brine and sub-soil brine viz: Sambhar Lake, Didwana, Phalodi and Pachbadhra.
- (c) Salt Works in Rann of Kutch using sub-soil brine viz: Kharaghoda, Dhrangadhra.
- (d) Rock salt Deposits at Mandi in the State of Himachal Pradesh.

The Principal salt producing centres are given in the Map-1.

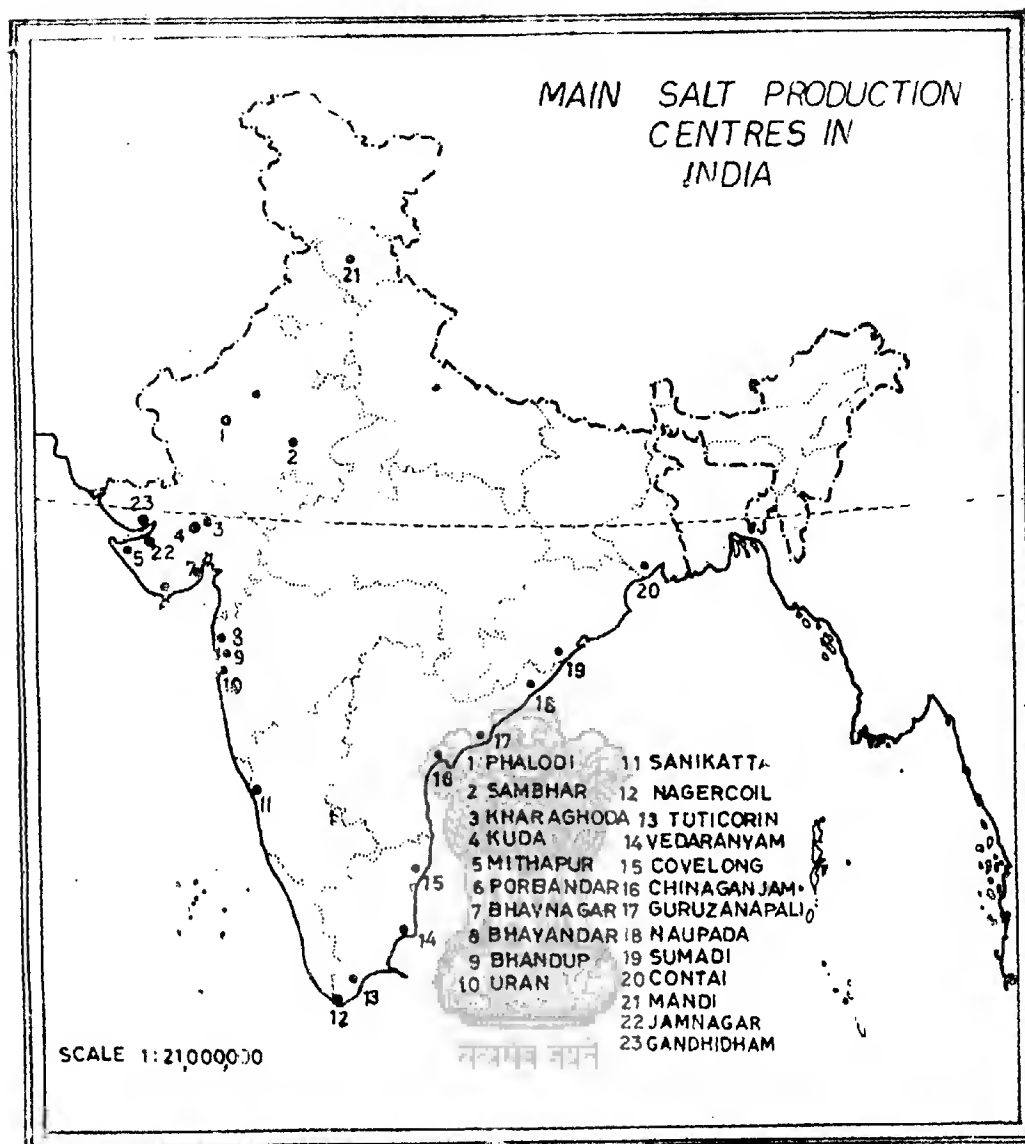
#### 2.4 CLASSIFICATION OF THE INDUSTRY :

The Industry can be broadly clasified in two Categories :—

- (i) Licensed Sector,
- (ii) Non-licensed Sector.

##### 2.4.1 Licensed Sector :

It comprises salt works licensed under the Central Excise & Salt Act, 1944. They are subject to the provisions of the Central Excise Rules, 1944 and Salt Cess Act, 1953 and the Rules made thereunder.



BASED UPON SURVEY OF INDIA MAP WITH THE PERMISSION OF THE SURVEYOR GENERAL OF INDIA  
THE TERRITORIAL WATERS OF INDIA EXTEND INTO THE SEA TO A DISTANCE OF TWELVE NAUTICAL  
MILES MEASURED FROM THE APPROPRIATE BASE LINE

THE BOUNDARY OF MEGHALAYA SHOWN ON THIS MAP IS AS INTERPRETED FROM THE NORTH-  
EASTERN AREAS (REORGANISATION) ACT, 1971 BUT HAS YET TO BE VERIFIED.

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Salt Works in this sector are grouped under the following categories :—

- Category I Salt Works whose licensed area exceeds 100 acres;
- Category II Salt Works whose licensed area exceeds 10 acres but does not exceed 100 acres and salt works of Co-operative societies, the area held by each individual member being more than 10 acres but not exceeding 100 acres;
- Category III Salt Works upto 10 acres in area on the land of Salt Department and within the notified limits of the Salt Factory and licensed Salt Works of Co-operative Societies the area held by each individual member, thereof not exceeding 10 acres.

#### 2.4.2 NON-LICENSED SECTOR (CATEGORY-IV)

After Independence, the Government of India set up a Committee under the Chairmanship of Shri H. M. Patel, the then Cabinet Secretary, to report on the steps necessary to overcome shortage and also to recommend measures for increasing salt production in the country. Accepting its recommendations, the Government issued a Press Note on the 23rd April, 1948, which was further modified in Press Note dated 11th May, 1955.

2.4.3 According to the Press Note individuals or groups may freely produce salt in any land to which they have lawful access for this purpose and by whatever process they desire, i.e. construction of pans and solar evaporation or boiling of brine or scraping or excavation of saline earth or natural formations of salt provided that the salt works set-up by any individual or group is not more than 10 acres. No licences are needed and no applications for licence need be sent to any Government authority in such cases. The provision of the Central Excise and Salt Act, 1944, will not stand in the way of the right of the Small scale manufacturers mentioned above. They are also exempted from levy of the Cess on Salt under the Salt Cess Act, 1953.

2.4.4 It is further stated that 'since the quality of salt has a direct bearing on the human health, the Government reserve the right in respect of the salt produced by manufacturers working in areas upto 10 acres, as in the case of all other salt production, to take suitable preventive measures against the sale of unwholesome salt or human consumption.' But this right was never resorted to, although there was a noticeable mis-use of 10 acre concession. Frequently complaints to this effect are received but the Salt Department is finding it extremely difficult to prove the abuse of 10 acre concession in the Court, mainly because the private manufacturers are able to manage to show their holdings in the names of the family members, each individual area not exceeding 10 acres albeit they work the entire area as a single unit.

2.4.5 Further concessions are given to the non-licensed sector in the matter of export and wagon-quota. In 1975, the Government permitted exports

from the non-licensed sector with a ceiling of 25 per cent of total exports. Later in 1979, Government of India, by the Press Note dated 1-1-1979 removed all restrictions in the matter of movement of salt produced by the small scale salt manufacturers. Thus they are permitted to get railway wagons under priority 'C' under the Zonal Scheme subject to the condition that the salt produced should conform to the ISI specification No. 253-1970 according to which sodium chloride content should not be less than 96 per cent and the manufacturers should have lawful access to the land.

#### 2.5 PRODUCTION STATE-WISE :

The state-wise figures of the salt production for years 1981-83 are given below. These figures include production from the licensed and the non-licensed sectors.

TABLE 1  
Salt Production (State-wise) : 1981-83  
(000 tonnes)

S. No.	State	1981	1982	1983
1.	Gujarat	5409	3751	3945
2.	Tamil Nadu	1596	1839	1567
3.	Rajasthan	954	743	609
4.	Maharashtra	562	437	422
5.	Andhra Pradesh	330	387	343
6.	Karnataka	24	23	25
7.	Orissa	17	98	72
8.	Goa, Diu & Daman	20	16	3
9.	West Bengal	5	9	13
10.	Himachal Pradesh	5	4	5
11.	Pondicherry	1	1	1
TOTAL		8923	7308	7005

The Gujarat State contributes about 60 per cent of the All India Production, followed by Tamil Nadu, Rajasthan, Maharashtra, Andhra Pradesh, Karnataka, Orissa, West Bengal, Goa, Diu & Daman, Himachal Pradesh and Pondicherry.

#### 2.6 LICENSED/NON-LICENSED SECTOR

The non-licensed salt production is concentrated in Gujarat, Tamil Nadu and Andhra Pradesh. The figures of production in the licensed and the non-licensed sectors for 1981-83 are given below:

TABLE 2  
Salt production, licensed and non-licensed sector  
(000 tonnes)

	1981	1982	1983
Licensed Sector	7602	5950	5624
Non-licensed sector	1321	1358	1381
TOTAL	8923	7308	7005

The non-licensed sector contributes about 18 per cent of the total production.

## 2.7 PUBLIC SECTOR

2.7.1 The private sector plays a dominant role in the salt industry contributing about 92 per cent of the total production. The public sector contributes only 8 per cent of the total production. The units are located in the States of Rajasthan, Gujarat, Maharashtra, Tamil Nadu, Orissa and Himachal Pradesh. Some of the units in Andhra Pradesh and West Bengal are worked in the joint sector. The details of the public/joint sector units are given below. Their licensed area is furnished in parenthesis.

Andhra Pradesh	M/s. East Coast Salt & Chemicals Limited, Naupada (Joint Sector Undertaking) (3471 acres)
Gujarat	1. M/s. Hindustan Salts Limited, Kharaghoda (A Govt. of India undertaking) (23595 acres) 2. Experimental Salt Farm, CSMCRI, Bhavnagar (Govt. of India) (500 acres)
Maharashtra	M/s. Development Corporation of Konkan Limited, Safala, (Govt. of Maharashtra undertaking) (1167 acres).
Orissa	1. M/s. East Coast Salt & Chemical Industry (Joint Sector) Sumadi (1154 acres) 2. M/s. Model Salt Farm, Chudamani, (Government of Orissa) (103 acres) 3. M/s. Jamboo Salt Works (Govt. of Orissa Project) (109 acres)
Himachal Pradesh	M/s. Hindustan Salts Limited, Mandi (Govt. of India Undertaking) (130 acres)
Tamil Nadu	1. M/s. Marthi Crystal Salt Company, Covelong, (Joint Sector) (3943 acres) 2. M/s. Tamil Nadu Salt Corporation, Mariyur (Govt. of Tamil Nadu Undertaking), with their units at Valinokkam, Ramnathapuram District, (5618 acres) and Sardar Vedaratnam Salt Project in Tanjore district. (2876 acres)

Rajasthan	1. M/s. Sambhar Salts Limited, Sambhar Lake (Govt. of India & Rajasthan undertaking) (57600 acres) 2. M/s. Rajasthan Govt. Salt Works (Govt. of Rajasthan undertaking) with their units at Didwana (1916 acres) & Pachbada (21442 acres)
West Bengal	M/s. Bengal Salt Company, Contal, (Joint Sector) (1651 acres)

2.7.2. The details of production of salt of the public sector units state-wise are given below. For the sake of comparison the figures in the private sector for the year 1983 are also furnished:—

TABLE - 3  
Production of salt in Public/Joint Sector  
(1981-83)

State	(000 tonnes)			
	1981	1982	1983	1983 (Private sector)
Rajasthan	449	291	285	324
Gujarat	222	152	158	3787
Tamil Nadu	25	50	10	1557
Maharashtra	8	5	5	417
Andhra Pradesh	8	3	5	338
Orissa	1	6	6	66
West Bengal	—	—	6	7
Himachal Pradesh	5	4	5	—
Karnataka, Goa, Dju, Daman & Pondicherry	—	—	—	29
<b>TOTAL</b>	<b>718</b>	<b>511</b>	<b>480</b>	<b>63-5</b>

## 2.8. SALT CO-OPERATIVES:

Co-operative movement in the Salt Industry is largely confined to Gujarat State. This sector accounts for about 10% of the total production, only a few co-operative societies are functioning well, serving the desired objectives and also contributing for the growth of Salt Industry in the country.

2.8.1. The break-up of the units and their production are given below:—

TABLE - 4  
Salt Co-operatives

	1981	1982	1983
No. of units	169	183	219
Production (000 tonnes)	1311	758	506

Some of the reasons for the decrease in production in the co-operative sector are:—

- (i) non-existence of marketing federation at Regional and National levels;
- (ii) lack of technical guidance;
- (iii) non-functioning in a true co-operative spirit;
- (iv) lack of working capital and finance, etc. etc.

## 2.9 SMALL-SCALE MANUFACTURERS

There are about 10,000 small scale salt manufacturers in the country with holdings not exceeding 10 acres, comprising category-III (licensed) and IV (non-licensed) and they account for about 30% of the total annual production of the country. This production during the last 3 years can be seen in the next paragraph.

### 2.10 CATEGORY-WISE PRODUCTION

The units of salt works of different categories and the production are given below. Category-I includes public sector (areas exceeding 100 acres), Category-II (areas exceeding 10 acres and upto 100 acres), Category-III includes co-operative sector and areas licensed upto 10 acres and Category-IV is non-licensed sector (areas upto 10 acres).

TABLE-5  
Salt Works-Category-wise units

	I	II	III	IV	Total
1981.	400	683	2643	6351	10077
1982.	442	703	2520	6880	10545
1983.	448	699	2531	6404	10082

TABLE-6  
Production (000 tonnes)

	I	II	III	IV	Total
1981.	5033	1014	1555	1321	8923
1982.	4030	907	1013	1358	7308
1983.	4213	693	718	1381	7005

## 2.11. EXPORTS

2.11.1. Due to the low salt production in 1976, the Government of India imposed a ban on the export of salt with effect from 30-9-1977. Exports to Nepal, Bhutan and Maldives were exempted from the ban order. With the improvements in the production in 1978, the ban on export of salt was relaxed. Depending upon the surplus available, a ceiling limit is fixed for the exports every year. The year-wise quota released for export and actual exports made are given below.—

TABLE-7  
Exports

Year	(000 tonnes)	
	Quota	Actual exports
1978-79	50	67
1979-80	250	112
1980-81	300	105
1981-82	500	237
1982-83	1000	327
1983-84	1200	549

2.11.2. Nepal, Bhutan and Maldives are the regular importers of Indian Salt, amounting to 1.2 lakh tonnes. Other importers are Bangladesh, Singapore, Korea, Philippines, East Africa etc. The country-wise figures of export to various countries are given in the Annexure-V.

2.11.3. STC carried out a study in 1982 on the problems and the prospects for export of salt from India and suggested the following measures for increasing the exports:

- (i) Quality of salt should be improved to that of international standards (mentioned in para 4.7);
- (ii) Rate of loading at Indian ports be increased;
- (iii) Infrastructure facilities should be created in ports for bulk loading;
- (iv) In future marine salt works should be located near the port to facilitate direct loading into ships.

The main emphasis in the report is the need for the improvement in the quality of salt as the foreign competitors are offering high quality salt in the export market. If the quality of salt is improved, India will be in a position to export about 20 lakh tonnes by 1990.

## 2.12 DEMAND OF SALT FOR EDIBLE PURPOSES

The generally accepted norm for the calculation of the requirement of salt for human consumption and also for cattle is the per capita consumption of 6 kgs. of salt per year. The Zonal Scheme for the distribution of salt formulated by the Salt Department is based on the per capita annual consumption of 6 kgs. The future requirement of salt for human and animal consumption is projected based on the above norm. Accordingly, the demand will be as follows:—

Year	In lakh tonnes
1985	45.29
1990	51.24
1995	57.96
2000	65.59

The projection of the demand of salt for human consumption from 1981 to 2000, (year-wise) is given in Annexure-VI.

## 2.13 INDUSTRIAL GRADE SALT

Salt is an important raw material for the manufacture of Caustic Soda, Soda Ash and Chlorine. The present consumption of salt by Chemical Industry is about 2.5 million tonnes per year. According to the

D.G.T.D. assessment that with the commissioning of new Soda Ash Plants at Tuticorin and in Punjab and new units planned in the country, the demand for industrial grade salt will increase to 48 lakh tonnes by 1990 and 70 lakh tonnes by 2000. Due to the strict enforcement of laws protecting environments from pollution, Chlor-Alkali industry will require

much purer grades of salt in the future. This, in turn, will need modernisation and adoption of more efficient technology in the manufacture and purification of industrial (alkali) grade salt as compared to the level of technology in use at present and the shift to membrane technology in the next 20 years.



सत्यमेव जयते

## CHAPTER—III

### 83. IMPROVEMENT IN SALT TECHNOLOGY :

3.1 Common Salt is manufactured in India by Solar evaporation of sea water, sub-soil brine or lake brine. A small quantity of salt is mined at Mandi in Himachal Pradesh. The chemical compositions of sea water, lake brine, sub-soil brine and rock salt are given in Annexure-VII. The quantity of finished product, namely salt, is no doubt dependent on the composition of raw material i.e. brine from which it is produced. Typical analysis of the Salt from sea, inland lake and sub-soil brine etc., are given in Annexure-VIII.

### 3.2 SALT EXPERTS COMMITTEE, 1950

The Salt Experts Committee, 1950 made detailed recommendations of technology improvements required in the Salt Industry region-wise. Even after thirty four years, the salt industry continues to be run like semi-agricultural unit employing age-old practices with consequent production of inferior grade salt. No serious attempts have been made by the Industry to adopt the latest technological innovations in design of salt works, brine control, harvesting, washing, storage, packing etc.

Some of the reasons for this state of affairs are:—

- (i) Technological innovations require capital investment which is not made available to the Industry through Government or through any other agency;
- (ii) there is no regular flow of information from other advanced countries nor any effort has been made to get the vital information on technological improvements elsewhere;
- (iii) none has been imparted training in advanced technology of salt manufacture in foreign countries;
- (iv) processes and techniques developed by CSMCRI are not translated into field action for want of Extension Centres;
- (v) no Model Salt Farm is being maintained, etc.

Salt is a very low value commodity and freight forms an important component in its delivered cost to the consumer. Added to the low value of the product, there are 10,000 salt producers in the country, varying in size from a cottage scale to a large scale. Hence, the task of improving technology and production methods to upgrade the quality is immense.

### 3.3 HIGH LEVEL SALT ENQUIRY COMMITTEE, 1980

The High Level Salt Enquiry Committee, 1980 observed that no system has so far been developed

to measure the progress in the application of improved technology or collect data in this regard. It is recommended that the Salt Department must take the lead in co-ordinating the formation of an intensive and extensive programme of technological development in this industry, in consultation with the CSMCRI, the salt producing State Governments and well-established consultancy design organisation. The Working Group also stresses this recommendation and it is required to be followed up.

3.4 Indian Salt Industry has a limited interaction with Salt Industry of advanced countries like France, Italy, USA, Mexico and Australia. No serious attempts have been made to study in depth the latest technological innovations abroad and to adopt them to Indian conditions. Consequently, Indian Salt Industry continues to function in isolation, with outmoded low technology and the cost of production is high as compared to the production in Solar Salt Works in foreign countries.

3.5 There is a considerable scope for modernization and induction of the technology to improve quality of various grades of salt. This can be done by intensive utilisation of the existing salt work and application of improved technology, adopting in-process quality control and mechanical washing methods. Each State has to adopt a more efficient technology, depending upon its weather conditions, source of brine etc. A State-wise analysis is given below :—

### 3.6 GUJARAT

3.6.1 The entire coastline of Gujarat has a favourable climate for salt manufacture, with a low annual rainfall of 50—60 cms, confined to July to October. This coupled with the high summer temperatures of upto 40°C, low relative humidity in the range 40—70 per cent and wind velocity around 20 km/hour assures a high evaporation rate. As a result, salt works have sprung up all along the coastline of Gujarat, accounting for 60 per cent of all-India production. The yield of marine salt works in Gujarat is about 50 tonnes per acre and of the inland Salt Works about 150 tonnes per acre.

3.6.2 With such favourable conditions for manufacture, the quality of marine salt is still in the range of 97 to 98 per cent in terms of NaCl. This can be raised to 99.5 per cent by adopting the following simple techniques :—

- (i) extraction of salt through series feeding system;
- (ii) washing of salt with fresh saturated brine followed by mechanical washing;
- (iii) bitterns regularly discharged, etc.

Most of the salt works in Gujarat are of Category- where process quality control methods can be introduced and mechanical washing systems can be set up.

### 3.7 MAHARASHTRA

With the rainfall ranging from 200 cms to 250 cms and the average relative humidity in excess of 75 per cent, evaporation rate is low in Maharashtra. Since the rainfall is confined to June to September and the remaining months are almost dry, production of salt is possible from November to May. The average yield is 25 tonnes per acre. Mostly the salt works are small and cater to the local edible salt markets only.

The following improvements are suggested :—

- (i) Larger Salt Works should adopt the multiple irrigation system.
- (ii) The lay-out of the Salt Works should be planned on the basis of availability of brine, its density, rate of evaporation and percolation.
- (iii) Feeding the crystallizers with unsaturated brine should be avoided.
- (iv) Bitterns should be regularly discharged.
- (v) Deep storage ponds should be tried for storing adequate quantity of brine at the end of the season.

### 3.8 GOA, KARNATAKA AND KERALA

The climatic conditions in Goa, Karnataka and Kerala are not very favourable for solar salt manufacture. Owing to the non-availability of flat acres close to the sea-coast the feasibility of developing medium scale salt works is ruled out. One or two pockets have been identified in Karnataka and Goa. Detailed survey needs to be carried out to establish production of salt in these areas.

### 3.9. TAMIL NADU

Tamil Nadu, the second largest salt producing state accounts for 20% of all-India production. There is a substantial climatic variation within the State, between Coimbatore in the North & Tuticorin in the South the yield per acre varies from 25 to 100 tonnes. With an average rainfall of 50 cms, air temperature of 35°C, high wind speed of 15 kms. per hour, long manufacturing season and availability of rich sub-soil brine, the area around Tuticorin forms an important centre of salt production. The following improvements are suggested :—

- (i) Lining of crystallizers with clay polyethylene film in areas where there is high percolation.
- (ii) Maintenance of proper ratio between concentrating and crystallizers areas.
- (iii) Adoption of multiple irrigation system.
- (iv) Improving brine supply in several salt works which suffer from brine scarcity during peak summer months, caused by sand bar formation.

- (v) Detailed geological study should be undertaken to determine reserve of sub-soil brine.

### 3.10. ANDHRA PRADESH

Andhra Pradesh has a coast-line of 1000 kms. along which there are a number of medium and small scale salt manufacturers producing salt by solar evaporation of sea water. There are only a few Salt Works which have an area of more than 100 acres. It has a short effective manufacturing season of six months. Average yield in the state is 20 to 30 tonnes per acre. There are large tracts of clayey land along the coast which are currently being taken up for the development by the Andhra Pradesh Government jointly with several private entrepreneurs.

The following are recommendations for the improvement of quality of salt in Andhra Pradesh :—

- (i) Realignment should be done with reference to the initial density of brine.
- (ii) Deep pond reservoirs for storage of brine should be provided.
- (iii) Drainage for rain water and bitterns should be maintained.
- (iv) Multiple irrigation may be adopted.
- (v) Brine supply to several salt works is to be improved.

### 3.11. ORISSA

The weather conditions in Orissa permit manufacture of salt only for 5 months. However, owing to the locational advantages of producing salt near the consuming area, the Government of Orissa has taken effective steps to identify several large areas for salt manufacture along the coast. The yield in the state is only 15 tonnes per acre. To increase the yield the following steps are suggested :—

- (i) Old lay-outs need to be realigned with reference to initial density of brine. The ratio between concentration and crystallisation areas should be high to allow a margin for the dilution of sea-water off the Orissa coast.
- (ii) Deep storage ponds should be constructed to store adequate quantity of brine by the end of the season.
- (iii) Pre-crystallisers should be maintained.
- (iv) Washing of salt may be done with fresh saturated brine.
- (v) Fishing operation should be controlled to prevent damage to pans of the Salt Works.

### 3.12. RAJASTHAN

Rajasthan is rich in saline earth and sub-soil brine. The brines are mostly contaminated with sodium sulphate and sodium bicarbonate. The

following steps are required to be taken for the improvement in the production of quality salt :—

- (i) Lay-out should be done on scientific basis.
- (ii) Crystallizers are charged with brine at appropriate density and bitters are regularly discharged.
- (iii) Washeries are provided for washing the salt.
- (iv) Semi-multiple/multiple irrigation system is adopted.

### 3.13 WEST BENGAL

With high rainfall, dilute sea-water and a dry season, the yield in this area can be maximised by adopting the following measures :—

- (i) Small holdings are consolidated.
- (ii) Realignment is done on a scientific basis.
- (iii) Brine is fed to crystallizers at correct density & regular discharge of bitters is maintained.
- (iv) Salt is washed by fresh saturated brine  $24^{\circ}\text{Be}$ .
- (v) Deep pond reservoirs are constructed to store high density brine in the off-season.

### 3.14. HIMACHAL PRADESH

Only a small quantity of rock salt is mined. To improve the quality and for full exploitation of this important natural source, solution mining technique should be utilised and iodised salt produced locally from the brine so obtained.

3.15. The data on meteorology, manufacturing season on yield, state-wise is given in Annexure-IX.

### 3.16. RECOMMENDATIONS :

#### 3.16.1. BASIC SCIENTIFIC DATA :

The Working Group considered the need for collection of basic scientific data on the design and the operation of solar salt works in different States. The basic scientific data on meteorology, soil mechanics, evaporation rate etc. should be collected, codified, and published by Salt Department. Information already available with Indian Meteorological Department, SCMCRI, big salt manufacturers like Tata Chemicals, MCIC, DCW and HSL may be obtained and used in the compilation.

New centres for collection of basic data on meteorology, soil porosity, net evaporation ratio etc. may be opened in different manufacturing centres (atleast 3 locations in each state) in consultation with Meteorological Department, CSMCRI, salt manufacturers etc. If any salt manufacturers come forward to provide the necessary infrastructure for collection of meteorological and environmental data, they may also be encouraged.

Salt Department should undertake the task of compilation of the existing data, opening of new centres for meteorological observations and the periodical publication of the data.

#### 3.16.2. DESIGN AND LAYOUT PLANS :

The design and layout of solar and Inland salt works, using the sea and the sub-soil brine, should be standardised for different areas i.e. 10 acres, 100 acres and 1000 acres, taking into consideration the weather conditions, salinity of the brine and the duration of the season, proper brine management for manufacture of quality salt, and the data published by the Salt Department.

The standard designs should provide—

- (i) sufficient space around for discharge of storm water during heavy rains and floods;
- (ii) brine ponds for conservation of residual concentrated brine for use in the next manufacturing seasons;
- (iii) suitable and adequate storage areas;
- (iv) supply channels to be used for transport of salt by small and light boats to the storage grounds to minimise the cost of transport.

#### 3.16.3. PARALLEL FEEDING VIS-A-VIS SERIES FEEDING :

The merits and demerits of the two systems of feeding the crystallizers were considered by the Working Group. While the system of series feeding is not recommended for general adoption, individual salt works should consider it on its own merits taking into consideration their pattern of product mix.

#### 3.16.4 USE OF BEAUME HYDROMETERS :

Beaume hydrometers should be supplied to all the salt works by the Salt Department to control the density of brine in the manufacture of salt.

#### 3.16.5. USE OF HARVESTERS :

The heavy duty harvesters used in Europe/USA/Australia/etc. are not suitable for Indian salt works but the Working Group strongly recommends the need for designing light weight, semi-mechanical harvesting appliances, which can be used in the standard size crystallizers in India. The proposed harvester (mechanical appliance) should be of such a design as to reduce the drudgery of the worker and to improve his efficiency. The aim of the harvester is not to replace the worker by the machine but make his work less arduous and more efficient and to increase the productivity per man hour.

#### 3.16.6. WASHING :

While it may not be necessary to instal a washery in each small salt works, for the salt manufacturers desiring to produce Industrial (alkali) grade salt, washery is a must. The Central Board for Prevention and Control of Water Pollution has stressed the need for the use of the purer grades of salt to prevent mercury pollution in caustic soda units. Many small scale producers are not in a position to produce the purer quality salt that is required for industry and for the manufacture of iodised salt and iron fortified salt.

Design of a suitable washery to upgrade the inferior grade salt manufactured by small scale producers is recommended. CSMCRI and Salt Department should explore and standardise a small washery for the benefit of small scale producers and salt co-operatives, within 3 years.

### 3.16.7 USE OF DYES

Use of dyes to improve the rate of evaporation is not recommended, as it involves health hazards, but it may be considered in consultation with the CSMCRI, Bhavnagar.

### 3.16.8 ADOPTION OF BIOLOGICAL CONTROL IN SALT WORKS

Adoption of biological control in salt works requires further study in consultation with the CSMCRI, Bhavnagar who have been working on Algae problems of Sambhar Lake.

### 3.16.9 PACKING

While Jute bags will continue to be used as the main packing material for salt, the use of HDPE/Polythene lined Jute bags for packing and transport of iodised salt and iron fortified salt is suggested to minimise the loss of iodine and iron on storage. The iodised/iron fortified salt should be repacked at the consuming centres for retail sale in polythene packets of 500 gms. and 1000 gms. capacity with ISI certification mark. *ISI marking certification at the repackers level he insisted upon as the cost of ISI marking may not be so high as to have any considerable effect on the sale price at the consumer's end.*

### 3.16.10. MODEL FARM AND EXTENSION CENTRES

One Extension Centre-cum-Model Salt Farm should be established in each of the salt producing states to identify the problems and to undertake the Research & Development activities in salt manufacture of each state, as the problems differ from one State to another. These Extension Centres may also take up the task of collecting the basic data, advising the manufacturers for production of better quality salt, adopting quick 'on the spot' analysis of salt, and disseminating the knowledge of improved technology on a continuing

basis. If need be, more Extension Centres may be established depending upon the necessity and the magnitude of the problems. These Extension Centres may be manned with sufficient staff at each centre with a small laboratory and with the necessary equipments under the control of the Salt Department, who have the expertise in the technology of salt manufacture. The major problems, which they cannot solve, may be referred to the Central Salt and Marine Chemical Research Institute, Bhavnagar. This should be undertaken as plan programme and completed by 1990.

### 3.16.11 LABOUR WELFARE

The welfare of the labour employed in the Salt Industry should be given top priority. Salt Department in consultation with the Salt Manufacturers Associations and State Governments should initiate action to provide basic amenities like drinking water, medical and educational facilities etc. Occupational hazards and diseases may be studied and remedial measures initiated by the Salt Department. The use of gum boots and goggles may be popularised and the advantages of their use explained to the workers.

### 3.16.12. STUDY OF SEA BARS ON THE EAST COAST AND USE OF PUMPS

Study of the sea bars on the East Coast was recommended to be undertaken by the National Institute of Oceanography to determine the causative factors for closure by bars and find out the remedial measures for keeping them open so that the salt works can draw sufficient brine for salt manufacture. Where it is not possible to keep the sea bars open, suitable pumping device for pumping sea brine with low head pumps direct from sea may be worked out at places, where large potential areas are available for development.

3.16.13. Indian Salt Industry should have regular contacts with the Salt Industry in advanced countries to know the latest technological developments.

3.16.14. The proposals for effecting the improvement in technology should be included in the Seventh Five Year Plan of the Ministry of Industry for implementation.



## CHAPTER-IV

### 4. QUALITY CONTROL

4.1. Quality Control is the regulatory process through which we measure the quality performance, compare it with the standards and act on the difference. Effective quality control comprises raw material control, process control, finished products' inspection, labelling, packing etc. till it reaches the ultimate consumer. Thus, the quality of the product can be looked upon as the degree to which it conforms to the specifications. The functions of the quality control include product development, design of manufacturing techniques, product inspection, marketing and service. It thus, ensures uniformity in quality, increase in production, reduction of cost and better utilisation of resources.

#### 4.2. SALT EXPERTS COMMITTEE, 1950

The Salt Experts Committee, 1950 conducted a detailed study of the Industry in all its aspects and favoured scientific re-alignment of the salt works, especially on the Coromandal Coast and in and around Bombay to produce better quality salt. It emphasised that the quality control should be introduced in the Salt Industry; suitable specifications should be laid down for edible salt and industrial salt. It also recommended establishment of Model Salt Farms in each salt producing state, to demonstrate production of high quality Salt.

#### 4.3 STANDARD ON EDIBLE COMMON SALT

On the recommendation of the Salt Experts Committee 1950, ISI prescribed in 1951 the following standard for edible common salt for human consumption :—

	(on dry basis)
(i) Sodium Chloride . . . . .	96% minimum
(ii) Insoluble impurities . . . . .	1% maximum
(iii) Other impurities . . . . .	3% maximum

The Government adopted this standard and fixed the minimum purity at 92% for the year 1951 which was to be stepped up yearly with a view to attain the standard of 96% NaCl by 1958. In order to enforce the prescribed standard, representative samples were drawn and analysed in the Salt Test Laboratories of the Salt Department and the salt found to be sub-standard, was not allowed to be issued for human consumption. These restrictions, however, led to representations from the Salt Manufacturers, especially from the States of Maharashtra, Andhra Pradesh, Tamil Nadu and Orissa. They pleaded that they should be allowed more time to achieve the standard. The system of compulsory quality control was withdrawn in 1957 by the Government and instead, only advisory and persuasive methods were adopted and continued.

#### 4.4 SALT COMMITTEE, 1958

Salt Committee, 1958 appointed by the Government of India also, examined the system of quality control in Salt Industry. It recommended that all salt manufacturers in the country should try to attain the ISI standard of 96% NaCl for edible use. However, no rigid enforcement of any prescribed standards should be adopted, as it is likely to cause hardship in certain cases, where manufacture of salt of high purity is not possible for reasons of climatic and other natural factors or of unscientific lay out of salt works. The Salt Department should give technical guidance to producers for the manufacture of good quality salt. Educative propaganda should be carried out by the Salt Department with a view to create a demand for, and secure production of good quality salt in the country. Steps should be taken to ensure that no export of salt below the specifications agreed to, takes place between the exporters and the foreign purchasers.

#### 4.5 STANDARDS ON SALT BY ISI

4.5.1 Since 1958, the quality requirement of common salt for various uses, necessitated ISI to lay down different standards depending upon the end use (edible or industrial purposes). Salt used for butter and cheese (Dairy Salt) should be of a very high purity. Industrial salt used for the manufacture of Caustic Soda/Soda Ash should have minimum impurity of Calcium/Magnesium salt, the detailed specifications of ISI standards on common salt are given in Annexure-X.

IS : 253 -- 1970 Edible Common Salt.

IS : 920 -- 1972 Common salt & Cattle licks for animal consumption.

IS : 7224 -- 1973 Iodised Salt.

IS : 593 -- 1978 Salt for Hide curing (Wet-salting).

IS : 4408 -- 1979 Sodium Chloride Analytical.

IS : 594 -- 1981 Salt for Fish curing.

IS : 797 -- 1982 Common salt for Chemical Industries

#### 4.5.2 EDIBLE COMMON SALT (IS : 253-1970)

In this standard, the requirements and methods of sampling and test for :—

- (i) Edible Common Salt;
- (ii) Table Salt; and
- (iii) Common Salt for butter and cheese industry (Dairy Salt)

have been prescribed. In case of table salt and dairy salt, high purity requirements have been specified.

#### 4.5.3. COMMON SALT AND CATTLE LICKS FOR ANIMAL CONSUMPTION (IS : 920-1972)

Common Salt is also used for animal consumption. This standard prescribes the requirements and methods of sampling and test of common salt for animal consumption and for cattle licks (also called Salt Licks).

##### 4.5.4 Iodised Salt (IS : 7224-1973)

Iodine, (in traces), is considered as one of the essential elements for proper functioning of the human body. The simple and inexpensive way to prevent goitre and iodine deficiency disorders (IDD) is the use of iodised salt in place of common salt. Potassium Iodide, Potassium Iodate and Calcium Iodate are the chemicals used for iodisation of salt. In this standard, limits for iodine content have been prescribed.

##### 4.5.5 Salt for Hide Curing (Wet-Salting) (IS : 593-1978)

Curing of hide requires a large quantity of salt. The two processes involved are :—

- (a) wet-salting.
- (b) dry-salting.

It specifies NaCl purity of 97 per cent and the limits for preservatives like Sodium pentachlorophenate sodium orthophenylphenate and zinc chloride.

##### 4.5.6 Sodium Chloride, Analytical Reagent (IS : 4408-1979)

Maximum purity of 99.9 per cent of Sodium Chloride has been prescribed for Analytical grade. It is used in laboratory for analysis purposes.

##### 4.5.7 Salt for Fish Curing (IS : 594-1981)

Special limits for Calcium and Magnesium as calcium at 0.5 per cent have been specified in this standard. The NaCl purity of 98 per cent is recommended for this grade.

##### 4.5.8 Common Salt for Chemical Industries (IS : 797-1982)

Salt is an important raw material for chemical industries and is used in the manufacture of Caustic Soda, Soda Ash and Chlorine. Industrial grade salt should be of high purity. Two grades of salt have been specified :

Grade I	Suitable for the manufacture of hydro-sulphite & optical brighteners or where a pure grade of the material is required.
Grade - II	Suitable for chemical industries, explosive and pyrotechnic industry and for the manufacture of Caustic Soda by electrolytic process.

##### 4.6 SALT STANDARD UNDER PFA ACT

Salt has been declared as Essential Commodity by the Central Government under the Essential Commodities Act, 1955. The quality standards for common salt are laid down under the Prevention of Food Adulteration Act, 1954. The Ministry of Health

and Family Welfare had notified on the 16th January, 1981 under the Prevention of Food Adulteration Rules, 1955 that the Sodium Chloride content of common salt used for edible purposes should be stepped up from 94 per cent to 96 per cent by 1-4-1985. (A copy of the Notification is enclosed in Annexure-XI).

Period of validity	Minimum percentage of Sodium chloride (NaCl) content (on dry basis)
Upto 31-3-1982	94.0%
from 1-4-1982 to 31-3-1983	94.5%
from 1-4-1983 to 31-3-1984	95.0%
from 1-4-1984 to 31-3-1985	95.5%
from 1-4-1985 onwards	96.0%

#### 4.7 FOREIGN STANDARDS

The average purity of salt in terms of NaCl content, for edible and other purposes, as specified by foreign countries is given below :—

Country	NaCl content (percentage) (on dry basis)
1. U.S.A.	99.4
2. Canada	99.0
3. France	97 to 99
4. Italy	97 to 98
5. Australia	97.5 to 99.4
6. Japan	99
7. Austria	99
8. Federal Republic of Germany	98

#### 4.8 INDUSTRIAL (ALKALI) GRADE SALT

4.8.1 The Central Board for Prevention & Control of Water Pollution appointed a Committee on the Techno-economic feasibility for manufacture of industrial grade salt to prevent mercury pollution of the environment by Chlor Alkali manufacturers. The presence of chemical impurities of calcium, magnesium and sulphate in common salt affects the electrolytic cells of caustic soda plants and increases the formation of a sludge containing mercury. Further, the manufacturers of Caustic Soda and Chlorine will be adopting the improved technology of membrane cell which requires salt of high purity.

4.8.2 The Committee, after deliberations, decided in 1983 the specifications for the industrial grade salt which are given below :—

##### SPECIFICATIONS FOR INDUSTRIAL GRADE SALT-I

Characteristics	Unit	Requirement
Sodium Chloride	% w/w	99.5 minimum (dry basis)
Calcium	ppm	400 maximum
Magnesium	ppm	150 maximum
Sulphate	%	0.1 maximum
Iron	ppm	20 maximum
Insoluble water	%	0.2 maximum
Moisture	%	3.0 maximum
Heavy metal	cc of H <sub>2</sub>	5.0 maximum

It was also recommended that suitable washeries be established at the appropriate places as model washeries, capable of producing industrial grade salt. This calls for a very high skill in the manufacture of common salt and its purification.

#### 4.9 IODISED AND IRON FORTIFIED SALT

##### 4.9.1 Iodised Salt

The iodised salt is used throughout the world for the eradication of goitre, cretinism and iodine deficiency disorders (IDD). Goitre is wide-spread in India. According to the Ministry of Health and Family Welfare, the problem has to be viewed on an all India basis. To make the programme effective, the salt used for iodisation should be of high purity, so that iodine is not lost on storage and transport, before it is used by the public.

##### 4.9.2 Iron Fortified Salt

The Ministry of Food and Civil Supplies has standardised conditions for the commercial production of iron fortified salt to eradicate anaemia. The specifications recommended for iron fortified salt are :—

(on dry basis)	
NaCl . . . . .	96.5% minimum
Water Insoluble matter . . . . .	1% maximum
Acid Insoluble matter . . . . .	0.3% maximum
Matter soluble in water other than NaCl	2.5% maximum
Magnesium (as Mg) Water soluble	0.10% maximum
Iron content (as Fe) . . . . .	850-1100 ppm
pH value in 5% solution in water	2-3.5
Moisture . . . . .	5% maximum
The limits of lead, copper, arsenic are fixed at 2.0, 2.0 and 1.0 ppm (max.) respectively.	

This calls for the up-grading of our common salt produced in the country.

#### 4.10 SALT TEST LABORATORY

4.10.1 To educate the Salt Manufacturers to improve the quality of salt, the Salt Department maintains eighteen Salt Test Laboratories located at the following places :—

Gujarat	1. Dhrangadhra
	2. Adipur
	3. Jamnagar
	4. Bhavnagar
	5. Ahmedabad
Tamil Nadu	6. Tirujarpet (Madras)
	7. Cuddalore
	8. Vedaranyam
	9. Adiramapatnam
	10. Veppoladai
	11. Tuticorin
	12. Rajakkamangalam
Andhra Pradesh	13. Naupada
	14. Balacheruvu
	15. Kakinada
Maharashtra	16. Wadala

West Bengal	17. Salkia Salt Golah.
	Howra .
Orissa	18. Humma

4.10.2 The laboratories are manned by qualified Chemists. The samples drawn from the various salt factories are analysed and the results communicated to the Salt Manufacturers. If the samples do not conform to the requirement under PFA Act, they are advised to take corrective steps to improve the quality. The impact of our advice on the Salt Manufacturers is not appreciable. The existing laboratories are inadequate to cover 19,000 Salt Manufacturers scattered over wide distances. There is not even one single laboratory in Rajasthan. Further, the laboratories are not provided with the latest analytical equipments and there is no refresher course for Chemists to learn the latest methods of analysis.

4.10.3 On evaluation of the data maintained in the Salt Department, it is seen that the salt manufactured by Category-I licensees, generally conforms to PFA standard whereas that manufactured by Category-II and III licensees is below the required standard. In the case of non-licensed salt producers, no systematic analysis of salt is carried out.

4.10.4 While there is an urgent need for manufacturing different grades of salt conforming to ISI specifications, greater emphasis is to be laid on up-grading the quality of salt produced by Categories-II, III & IV (non-licensed) to conform to 96 per cent NaCl as per the PFA Act. The Working Group recommends that this calls for various intensive and continuous measures on improvement of Technology, Quality Control, and Training of small scale salt manufacturers.

#### 4.11 MODEL SALT FARMS

On the recommendations of the Salt Experts Committee, 1950, four Model Salt Farms were established at :—

- (i) Wadala.
- (ii) Tuticorin.
- (iii) Shiroda.
- (iv) Sumadi.

They were closed during 1965 which was a severe set-back to the Salt Industry. The CSMCRI, Bhavnagar, had set up an experimental salt farm in 1964 at Bhavnagar.

#### 4.12 RECOMMENDATIONS

4.12.1 The Working Group considered the existing quality control exercised by the Industry and the Salt Department. They are found to be inadequate and ineffective. As a result, the ISI standard of 96 per cent NaCl purity of edible common salt stipulated in 1951, has not been achieved even after 34 years. The Salt Department should evolve effective quality control mechanisms to enable small-scale salt manufacturers to improve their quality by adopting.

- (i) improved technology in the manufacture ;
- (ii) scientific re-alignment of salt works ;
- (iii) education and training of workers.

The personnel of the proposed Extension Centres should regularly visit the salt works, study the problem, analyse salt samples by quick methods and advise the small-scale salt manufacturers for adoption of improved technology and process control in their units.

#### 4.12.2 QUALITY CONTROL CIRCLES

The Japanese method of quality control should be studied by the Salt Industry and adopted with appropriate modifications to suit Indian conditions. Public sector units and private sector Category-I licensees should take a lead in the adoption of this method.

#### 4.12.3 REVIEW OF STANDARD ON SALT

The Indian Standards Institution and Ministry of Health & Family Welfare should review the progress and achievements of the Salt Industry after 3 years. Based on the findings, they should review their specifications for NaCl content in salt to bring it at par with the international standards.

#### 4.13 CRASH PROGRAMME

4.13.1 The Working Group recommends the following crash programme (first priority measures) to be carried out in two years to revitalise the existing Salt Test Laboratories and to up-grade them as Extension Centres by adopting the following measures :—

- (i) They should be equipped with the proper instruments for undertaking quick analysis of salt ;
- (ii) Each laboratory should be manned by three qualified Chemists with adequate supporting staff for undertaking frequent field visits ;
- (iii) The existing laboratories at Dhrangadhra, Adipur, Tuticorin and Naupada should be housed in suitable buildings and enlarged.

4.13.2 New Laboratories/Extension Centres should be immediately open at the following places :—

Rajasthan	1. Jaipur
	2. Phalodi
	3. Jodhpur
Gujarat	1. Kharaghoda
	2. Bharuch
Maharashtra	1. Bhayander
Tamil Nadu	1. Covelong
Andhra Pradesh	1. Chinaganjam
	2. Iskanalli
Orissa	1. Bhubaneswar
West Bengal	1. Contai

4.13.3 Chemists manning the Laboratories/Extension Centres should be properly trained in the latest salt technology, quality control, techniques and analysis of salt samples utilising facilities available at CSMCRI, Hindustan Salts Limited, private manufacturers like Tata Chemicals, MCIC and DCW, etc.

Audio-Visual Aids should be provided and extensively utilised in educating the salt manufacturers. Each Circle/Division should be provided with Jeeps/Vehicles for carrying out the above tasks on a crash programme.

#### 4.14 SHORT-TERM MEASURES

Under the short term measures (second priority measures), the Working Group recommends :—

- (i) the Salt Department in consultation with the salt manufacturers should prepare pamphlets in simple, non-technical terms (in regional languages) on appropriate salt technology for each category to produce better quality of salt ; and make it available freely to all salt manufacturers ;
- (ii) to standardise the design of salt works of different regions, depending upon the source of brine, climate and soil conditions etc., and publish it in regional languages ;
- (iii) providing financial assistance liberally from the Salt Cess Proceeds by way of loans and grants for Co-operative Societies to undertake realignment of salt works.

#### 4.15 LONG-TERM MEASURES

Working Group recommends the following long term measures :—

Regional Design and Quality Control Laboratories should be established at the following places :—

- (1) Tuticorin.
- (2) Kakinada.
- (3) Jaipur.
- (4) Dhrangadhra.
- (5) Bombay.

The main functions of the regional laboratories should be to guide and assist the salt producers to improve quality, increase productivity, encourage production of Iodised/Iron Fortified salt, boost exports of salt, etc. and to train salt workers. The recommendations should be included for implementation in 7th Five-Year Plan of the Ministry of Industry.

## CHAPTER V

### 5. TRAINING

5.1 Training forms an important part of the education of the workers to increase their productivity and to improve the quality of the products. The Salt Department recently conducted two training courses in salt technology for professionals (with a minimum qualification of degree in Science). They were conducted at Madras in August, 1981 and at Jamnagar in May, 1982. About 40 salt technologists from the States of Tamil Nadu, Andhra Pradesh, Orissa, West Bengal, Gujarat and Maharashtra were trained in these programmes. Similarly, the Salt Department in collaboration with the Govt. of Andhra Pradesh organised a 30 day training programme for the Salt Artisans of Andhra Pradesh in September—October, 1983 at Tuticorin. Central Salt & Marine Chemicals Research Institute, Bhavnagar arranges a two-day annual get-together of the Salt Manufacturers at various centres in India.

5.2 The Working Group considered the existing facilities on training in Salt Industry at various levels in the country. Realising that there is a vacuum in this field, it recommends the Salt Department to organise regular, annual training programmes. The workers and professionals in the Salt Industry may be covered as follows :—

- (i) to train skilled and semi-skilled workers at grass root level (for improving skills) ;
- (ii) to train existing technicians employed in the Industry ;
- (iii) to train middle and top level managers of the Salt Industry ;
- (iv) to train new entrepreneurs ;
- (v) to arrange annual meetings of salt manufacturers for exchange of technology amongst the salt producing states.

#### 5.3 TRAINING OF WORKERS

Salt Industry in India is tradition—bound and technical skills are inherited within the family from father to son. The aim of the training programme for workers is to improve their productivity and to teach them new skills. They should, therefore, be given practical demonstrations in the field and in the environment to which they are exposed. Audio-visual aids like the slides, 16 mm films, Video Tapes etc. should be extensively used for this purpose. Each salt producing State may be provided with the above facilities. It should be carried out as a high priority programme.

#### 5.4 TRAINING OF EXISTING TECHNICIANS

The technicians in the Industry should have refresher courses of three months duration so that

they are brought upto date with the practices followed in different parts of India and the world, both in theory and practice. These technicians from the private and public sector manufacturing units and the Salt Department will form the nucleus to train workers at the grassroot level. The refresher courses may be designed and arranged by the Salt Department and CSMCRI in consultation with large salt manufacturers, like Tata Chemicals, Mithapur, Mettur Chemicals and Industrial Corporation, Vedaranyam and Hindustan Salts Ltd., Jaipur, etc.

#### 5.5 TRAINING OF MIDDLE & TOP LEVEL MANAGERS

The middle and top level managers of Salt Works should be trained and the short term courses including the one on management be formulated by the Salt Department in consultation with CSMCRI, Bhavnagar.

#### 5.6 TRAINING OF ENTREPRENEURS

There should be a regular course for entrepreneurs desiring to invest in new salt works. It may be designed and organised by the Salt Department with the assistance of CSMCRI. Wide publicity should be given for such a course.

#### 5.7 TRAINING OF FIELD OFFICERS OF SALT DEPARTMENT

The Salt Department Officers viz., Inspectors, Deputy Superintendents and Superintendents of Salt should be trained in the various aspects of the Salt Technology so that they will be in a position to train the salt workers at the grass root level. The Salt Department should organise and complete the training of their staff within a period of three years. This should be undertaken as a high priority programme. Necessary infrastructural facilities like laboratories, vehicles and books should be provided to them. The Ministry of Industry may provide the necessary financial support to the Salt Department in their future budget to achieve this objective. For immediate implementation of these training programmes, the available facilities in the public sector Government training institutes should be made use of till a permanent infrastructure is created by the Salt Department and the Salt Industry. Formation of a separate division for organising, conducting and monitoring these training programmes in the Salt Commissioner's Office is recommended.

#### 5.8 GENERATION OF NEW SALT TECHNICIANS

The technology generating institutions, viz., Universities and Technical Institutes, in the country should be asked to include Salt Technology as one of the subjects in their course of study. The syllabi for Salt Technology course in Polytechnics and Degree and Post-graduate Courses in Colleges should be

drawn up by the Salt Department in consultation with the UGC, CSMCRI and forwarded to the Ministry of Education.

#### 5.9 TOOLS USED IN THE INDUSTRY

It is found that the tools used in the Industry are tradition-bound and also vary from State to State. Some tools used in some regions are found to be more advantageous than the existing ones in other regions. There should be a cross fertilisation of ideas and equipments used in the Salt Industry among the various States. The Working Group recommends that the present tools used in the Salt Industry should be improved and semi-mechanical devices for preparation of pans and harvesting of salt should be devised. This would increase the productivity and reduce the drudgery of the workers. The Salt Industry now experiences a shortage of labour at the peak salt harvesting season, especially in the months of May and June. This is due to the arduous working conditions in the harvesting season viz. : exposure to sun and hard work. To meet the situation NPC, CSMCRI and other National Institutions should be approached to devise semi-mechanical devices for harvesting of salt.

#### 5.10 TECHNOLOGY TRANSFERS AMONGST MANUFACTURERS

Different methods of preparation of pans, harvesting, storage etc. are adopted in Gujarat, Tamil Nadu, Maharashtra and Andhra Pradesh. There should be an exchange of ideas and visits amongst the manufacturers and workers of the different salt producing States to increase the productivity. The Working Group unanimously recommends that there should be an annual get-together of salt manufacturers of different regions for exchange of ideas and techniques. The proposed Annual Conference of salt manufacturers should be practice-oriented and include visits to salt works in the region, etc., so as to learn from one another. These get-togethers will lead towards adoption of optimum technology at the National level and improve the productivity. This may be arranged by the Salt Department in consultation with the various Salt Manufacturers' Associations in the country.

#### 5.11 EDUCATION THROUGH MASS MEDIA

A full length film 'how to make good quality salt' should be produced, depicting all steps involved from A to Z in the Salt Manufacture. The break down of jobs should be written down and depicted clearly with the assistance from the Salt Manufacturers' Associations. The Salt Department should produce pamphlets and films on 'how to produce good quality salt' and give them wide publicity.

#### 5.12. TEXT BOOKS AND MONOGRAPH ON SALT

There is no standard text book on salt technology for teaching in colleges and polytechnics. Two text books are required—(i) for the Degree Course and (ii) for the Diploma Course. The need for a Monograph on Salt for use by the salt manufacturers is keenly felt. Salt Monograph should be written in clear and simple language and made available to all

manufacturers. Only proven methods and technologies should be advocated for adoption by small scale manufacturers. It should be a priced publication. The writing of the books and Monograph should be undertaken by the Salt Department in consultation with the CSMCRI and salt manufacturers with long experience on high priority basis.

#### 5.13. STANDARDISATION OF PUMPS FOR THE SALT INDUSTRY

Pumps of low head and large capacity are needed in salt works. Existing pumps in the market are meant for use in agriculture and houses. The pumps manufacturers should be approached to standardise high capacity, low head pumps for use in salt industry to save energy.

#### 5.14. ANNUAL AWARDS FOR BEST WORKERS

The Salt Department should work out a suitable Scheme for institution of annual awards for best workers of various categories in the Salt Industry to encourage initiative and productivity amongst workers. There is no incentive and encouragement in Salt industry for the adoption of improved technology.

#### 5.15. RECOVERY OF BY-PRODUCTS

It is in the national interest to recover chemicals from the bitterns viz. : bromine, potash, magnesium and sodium sulphate, etc. The details of availability of bitterns and its concentration, transport and storage are to be studied in depth. Salt Department with the assistance of big salt manufacturers should collect the basic data on bitterns and make it available to the Industry.

#### 5.16. POTASH

As regards preparation of mixed salt for recovery of Potash, CSMCRI may be requested to study further the possibility of its extraction from bitterns from places of high humidity like Vedaranyam and Andhra Pradesh, etc. It was pointed out that in places of high humidity, the brine cannot be evaporated beyond 32° Be' to 34° Be' to get the mixed salt of appropriate composition. This requires further study and it may be made by CSMCRI. The process of direct recovery of Potash from bitterns has to be standardised.

#### 5.17. FEDERATION OF SALT MANUFACTURERS, ASSOCIATIONS

The Working Group recommends that the existing Salt Manufacturers' and Merchants' Associations in the country should form a Federation and it be organised on the basis of Alkali Manufacturers' Association, so as to provide the necessary link between Salt Department/Central Salt & Marine Chemicals Research Institute/Government and the Industry and take up many of the projects of educating salt workers and improving working conditions of salt workers.

5.18. To sum-up, the Working Group recommends that the following measures on training be carried out as a crash programme :

5.18.1. The Salt Department should arrange to conduct training programmes to train their officers in the quality control, salt technology, washery, etc.

within 3 years. Adequate inputs, both financial and man-power, to carry-out the programmes should be provided in the budget. Thereafter, there should be refresher courses for the technical staff, once in every three years. This would enable every employee to get training in the latest methods of salt technology and quality control. Salt Department should work-out details for the creation of a suitable machinery or an agency to carry-out the training programmes.

5.18.2. Training of salt workers and technicians should be included in the annual budget of the Salt Department and priority should be given for training of workers from Andhra Pradesh, Orissa, West Bengal, Karnataka and Maharashtra.

5.18.3. Audio-visual aids should be used extensively for imparting training to technicians on how to produce good quality salt.

#### 5.19. SHORT-TERM MEASURES

Salt Department should draw details of short-term measures for the generation of new salt technicians, training of the middle level professional, entrepreneurs and conducting annual conferences of salt manufacturers.

#### 5.20. LONG-TERM MEASURES

Books and Monographs on Salt, should be written in collaboration with other National Institutes and CSMCRI. Publication of a monthly periodical in various languages on different aspects of Salt Industry is recommended.



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## CHAPTER-VI

### 6. MARKETING AND DISTRIBUTION OF SALT

6.1 Marketing and distribution of salt in India is a vast and complex process. Apart from such considerations as distances and difficulties of communications, the sources of supply are concentrated in Tamil Nadu and Gujarat, while the consumption is in every nook and corner of the country.

#### 6.2. ZONAL SCHEME

6.2.1. Considering the vastness of the country and the limited availability of transport, the Cabinet Sub-Committee, under the Chairmanship of Shri H. M. Patel suggested in 1947 that the distribution pattern of salt should be organised so as to ensure optimum use of transport capacity available by all modes. Accordingly, the routes of movement of salt by rail are rationalised with a special emphasis to cater to the needs of scarcity areas. Under the scheme prepared in consultation with the Railway Board, unnecessary long hauls and criss-cross movement of salt are eliminated. The Zonal Scheme, as popularly called, takes into account the total production of the area, actual requirement in different areas, optimum utilisation of the transport and resources available under the various modes. Under the Zonal Scheme, salt has been classified under four different priorities of the Preferential Traffic Schedule (a Schedule drawn up by the Railways for granting priority to the different commodities in the order of their importance to the society and economy). Under the preferential traffic schedule, the Military movement for operational requirements gets the highest priority 'A'. Next in the order comes priority 'B', then come priorities 'C', 'D' and 'E'. Under the Zonal Scheme, the following priorities are given for movement of salt :—

'B'—for movement of iodised salt for goitre endemic areas;

'C'—salt for human consumption programmed by the Salt Commissioner;

'D'—Industrial grade salt; and

'E'—Non-programmed salt.

6.2.2. Once in five years, the Salt Department assesses the requirements of the edible salt for different States on the basis of its population and fixes its requirements at the rate of 6 kgs. per head, per annum. Taking into account the convenience of the sources of production and the most rational pattern of the movement possible, the quantity of salt is earmarked to each State and the Railways are obliged to move that quantity under priority 'C'. This quota is, further divided amongst the different loading points, on quarterly or monthly basis by the Railways. The last revision of the Zonal Scheme was carried out in March, 1984 and it is based on the

population of 1981 Census. It is given in the Annexure-XII. The salt works and loading stations are grouped for convenience into six Zones as follows (Map-2) :—

1. Rajasthan
2. Kharaghoda
3. Jamnagar
4. Bombay
5. Madras
6. Calcutta.

6.2.3. The quantity of salt programmed to be moved in 1984 from various Zones by different modes of transport (by rail, road and sea) are given below :—

TABLE - 8  
Zonal Quota - 1984  
(in 000 tonnes)

Zone	Quantity		Total
	Rail	Road/Sea	
1. Rajasthan . . . . .	538	85	623
2. Kharaghoda . . . . .	574	51	625
3. Jamnagar . . . . .	953	234	1187
4. Bombay . . . . .	447	176	623
5. Madras . . . . .	705	583	1288
6. Calcutta . . . . .	101	174	275
<b>TOTAL :</b>	<b>3318</b>	<b>1303</b>	<b>4621</b>

#### 6.2.4. WAGON QUOTA

The wagon quota from each zone (Broad Gauge and Metre Gauge) is given below :—

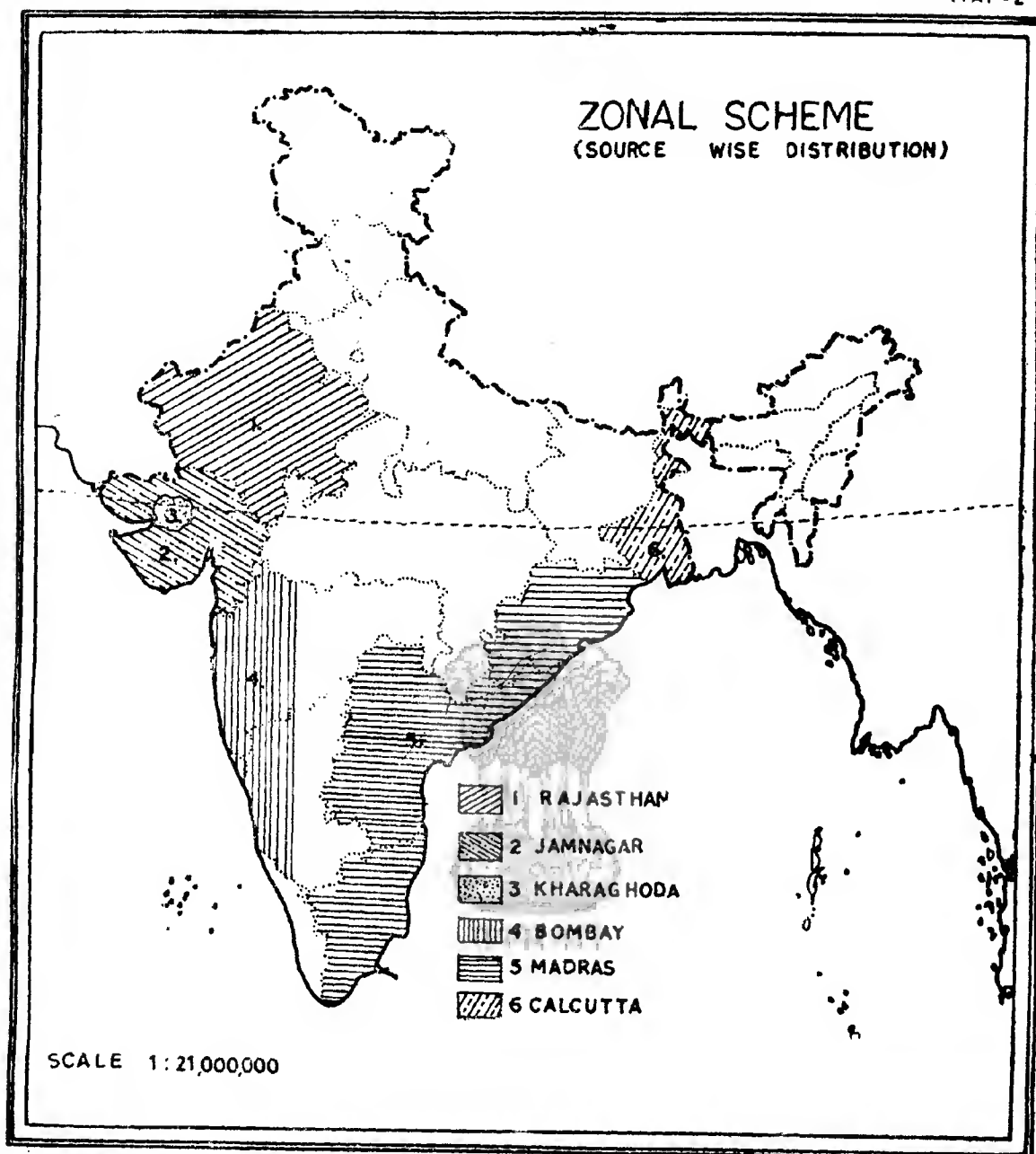
TABLE - 9  
Wagon Quota - 1984

Zone	B.G.	M.G.
1. Rajasthan . . . . .	—	29892
2. Kharaghoda . . . . .	23915	—
3. Jamnagar . . . . .	24887	19795
4. Bombay . . . . .	18639	—
5. Madras . . . . .	13077	21734
6. Calcutta . . . . .	4184	—
<b>TOTAL .</b>	<b>84702</b>	<b>71421</b>

(B.G. unit=24 tonnes and M.G. =tonnes)

6.2.5. Gujarat and Tamil Nadu alone contribute about 75% of the total salt production in the country. The States in sub-Himalayan region, Indo-Gangetic





BASED UPON SURVEY OF INDIA MAP WITH THE PERMISSION OF THE SURVEYOR GENERAL OF INDIA  
THE TERRITORIAL WATERS OF INDIA EXTEND INTO THE SEA TO A DISTANCE OF TWELVE NAUTICAL  
MILES MEASURED FROM THE APPROPRIATE BASE LINE

THE BOUNDARY OF MEGHALAYA SHOWN ON THIS MAP IS AS INTERPRETED FROM THE NORTH-  
EASTERN AREAS (REORGANISATION) ACT, 1971 BUT HAS YET TO BE VERIFIED

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valley and the North-Eastern States have no sources of salt. Their requirements of salt for edible and industrial purposes have to be obtained from Gujarat Tamil Nadu or Rajasthan. The annual demand for salt of these States for edible purpose amounts to 25.40 lakh tonnes (Annexure-XIII). Salt is also transported by road and sea (from West Coast and Tuticorin to Calcutta). The quantity of salt programmed and actually moved by various modes of transport for 3 years is given below :—

TABLE 10  
Movement of Salt (1981-83) by Rail, Road and Sea.  
(in 000 tonnes) —

	1981		1982		1983	
	P	A	P	A	P	A
Rail . }	2622	2481	2622	2470	2622	2163
Road . }		1131		1064		1209
	1312		1312		1312	
Sea . }		146		189		155
<b>TOTAL</b>	<b>3934</b>	<b>3758</b>	<b>3934</b>	<b>3723</b>	<b>3934</b>	<b>3527</b>

(P = Programmed, A = Actual).

The statistics on movement of salt by rail, priority-wise 'B', 'C' and 'E' are given below :—

TABLE - 11  
Movement By Rail Category-wise  
(1981-83)

Priority	(000 tonnes)		
	1981	1982	1983
'B' . . . . .	136	119	141
'C' . . . . .	2226	1585	1128
'E' . . . . .	119	766	894
Sub-Total . . . . .	2481	2470	2163
'D' . . . . .	483	480	408
<b>Grand Total</b> . . . . .	<b>2964</b>	<b>2950</b>	<b>2571</b>

#### 6.2.6. MOVEMENT TO INDUSTRIES

Salt required by industries is moved under priority 'D' slightly lower than for edible salt. The quantum of requirement is certified by the DGTD or the Director of Industries and the movement is authorised by the Railways according to the quotas granted by the Salt Department. Normally, Soda Ash and Caustic Soda units located near salt producing areas obtain their requirement by road. Some units like Tata Chemicals, Mithapur and Dhrangadhra Chemical Works, Arumuganeri have captive salt works at the site. However, it has been noticed that in the recent years a number of industrial units have come up in the country requiring substantial movement of industrial salt over long distance. This pattern of movement of industrial salt to these units is, at present, not rational. For example some of these units located on Broad Gauge are getting their salt requirements from Metre Gauge loading stations and

vice-versa involving unnecessary transshipment which can be avoided. It is, therefore, suggested that a rationalised programme for movement of industrial salt is laid down periodically by joint consultation with the Salt Commissioner, the Railways and the industrial units. Such meetings at periodic intervals are very necessary. It has further been noticed that some of these units have gone into operation without having provided adequate handling facilities for their Inward & Outward traffic in the form of a block rake siding, etc. For example, the one in Bihar recently set up near Garwa Road. Unless adequate handling facilities are provided, the Railways will not be able to transport the required quantities commensurate with releases of wagons within the normal permissible time.

6.2.7. The quantity of salt moved for industries by various modes is given below :—

TABLE 12  
Movement of industries. By Road, Rail and Sea (1981-83)  
(in 000 tonnes)

	1981	1982	1983
Road . . . . .	1688	1544	1871
Rail . . . . .	483	480	408
Sea . . . . .	206	142	163
<b>—TOTAL . . . . .</b>	<b>2377</b>	<b>2166</b>	<b>2442</b>

#### 6.3. SUPPLY OF SALT TO WEST BENGAL AND NORTH-EASTERN STATES

6.3.1. The Committee of Economic Secretaries decided in 1975 that Zonal salt for Assam and other north-eastern States will move under all rail routes. Further, salt required by West Bengal both for edible and industrial purposes will move by Sea and rail route, via Calcutta. This decision was partly amended to the effect that 1.44 lakh tonnes of salt per annum will move by rail route to West Bengal and the remaining 2.33 lakh tonnes will move by Sea from West Coast and Tuticorin. The Director General of Shipping, Bombay is responsible for the allotment of ships for carriage of salt to Calcutta.

6.3.2. Details of the shipments of salt from West Coast and Tuticorin to Calcutta during the last 3 years are given below :—

TABLE 13  
Shipment to Calcutta (1981-83)  
(in 000 tonnes)

	1981	1982	1983
West Coast . . . . .	19860	35229	37801
Tuticorin . . . . .	61632	87280	81358
<b>TOTAL . . . . .</b>	<b>81492</b>	<b>122509</b>	<b>119159</b>

#### 6.4. MARKETING OF SALT BY SMALL-SCALE PRODUCERS

6.4.1. The difficulties experienced by the Small-Scale Salt Producers and Co-operatives in marketing

of salt and obtaining working capital and refinance from financial institutions in the country were deliberated by the Working Group. They do not get remunerative price due to lack of bargaining power, and are exploited by salt traders. Only recently, Industrial Development Bank of India (IDBI) has recognised salt manufacture as an 'Industry' under Section 2(2) of the IDBI Act, 1964 to become eligible for financial assistance under its 'Refinance Scheme'. This fact should be given wide publicity amongst salt manufacturers. Nationalised Banks should be advised to meet the financial requirements of salt manufacturers under the refinance scheme.

6.4.2. As the financial problems of Salt Co-operative Societies are unique, the Working Group recommends that the National Bank for Agriculture and Rural Development (NABARD) be requested to study their financial requirement and work out a suitable Scheme to assist them to produce better-grade salt and to improve their marketing capability. The Salt Department should take a lead and keep permanent liaison with NABARD.

## 6.5. RECOMMENDATIONS

6.5.1. According to the rationalisation Scheme of the Railways, movement in rakes from one loading station to a single destination is given preference. In this process, the small-scale salt manufacturers are thrown out of business by their inability to sponsor rakes. The Working Group considered it in details and while agreeing with the Railways to favour despatch of salt in rakes, wherever possible, it advocated that Railways should permit formation of one rake with wagons to 2 or 3 destinations. Single destination should not be insisted upon.

6.5.2. When Salt production at one locality is not sufficient to form rakes, the Railways should accept tenders in wagon loads. Names of such loading stations will be furnished by the Salt Department to the Railways.

6.5.3. As salt is to be carried over long distances—over 2000 kms. (from Tuticorin to Assam and Gandhidham to West Bengal), the Railways should provide covered wagons. The present practice of giving open wagons should be dispensed with. If there is a shortage of covered wagons, the Railways should go in for construction of more covered wagons in the national interest. In view of the recommendations of the Working Group that by 1990 all edible salt be iodised, the Railways should programme to provide covered wagons for movement of 3 million tonnes of salt by 1990.

6.5.4. The Working Group also recommends that the Railways should design special 'Dedicated Wagons' for movement of edible salt, i.e. iodised salt.

6.5.5. In the interim period, covered wagons should be supplied atleast during the monsoon from June to December. In the case of supply of open wagons during this period, tarpaulin should be provided for covering at the cost of the Railways.

6.5.6. However, the Railways expressed that they have to meet the transport needs of various sectors

and a number of commodities like cement, food-grains, fertilizers, etc. besides salt. The Railways do not have adequate resources to provide dedicated wagons for transport of each commodity and, therefore, general purpose wagons are the optimum choice in such a situation. It will not be possible for the Railways to provide either covered wagons or dedicated wagons for movement of salt even in the near future. It is, therefore, suggested that it would be advisable in over-all economic interest to devise suitable packing materials for salt which can withstand damage by rain during transit in the open wagons. The incremental cost to economy for providing better packing will be very much less than the cost of acquiring a fleet of the covered or the dedicated wagons for salt transport on the Railways. Further, it has been noticed that salt being corrosive causes damage to the wagon during the transit and a better packing material will go a long way in reducing such damage to Rolling Stock. If the cost of better packaging of salt is not to be transferred to the actual consumer, some subsidy will be called for and should be immediately considered.

6.5.7. The Working Group also deliberated on the lack of facilities, i.e. stacking yard, approach road and separate siding, etc. at the loading and un-loading ends, which hinder free movement of salt from the production centres to the consuming areas. The details of such facilities required by the Industry should be worked out by the Salt Department in consultation with Salt Associations, State Governments, NCCF, STATFED and intimated to the Railways. Assistance from Salt Cess Proceeds may be provided wherever feasible. The Railways should provide these minimum facilities in a phased manner by 1990 and include them in their 7th Five-Year Plan.

6.5.8. To sort out the day-to-day problems in the movement of salt by Railways, regular monthly meetings should be held by the Salt Department officials at the Divisional level of the Railways.

6.5.9. Effective involvement of the State Governments and the Directorate of Civil Supplies of the salt consuming States is necessary for ensuring timely and adequate supplies at various consuming centres in the country.

6.5.10. As the Railways are unable to move salt to each and every station, salt consuming States should be asked to create salt storage dumps at suitable strategic points near the rail heads.

6.5.11. Many of the Salt Works lack in approach roads to transport salt. The salt producing States should be asked to create and/or improve the infrastructural facilities like road/jetties, etc. for the development of salt industry and transport of salt in their respective States.

6.5.12. One of the constraints in moving salt in ships from West Coast and Tuticorin to Calcutta is the high freight rate. It is in the national interest to encourage Coastal Shipping to relieve the burden on rail movement. The coastal freight rate should be reduced and brought at par with that of the Railways.

6.5.13. The semi-mechanical loading/un-loading facilities may be created at Kandla, Tuticorin and Bombay Ports to increase the rate of loading and un-loading of salt for despatches to Calcutta/Bombay and also for export to foreign countries.

6.5.14. The Director of Ports, Government of Gujarat may be impressed upon to improve the facilities for loading of salt at the minor ports in the State.

6.5.15. The minor ports, situated in the important salt producing centres on the East Coast, especially Bhavanapadu in Andhra Pradesh, may be developed to enable shipment of salt to Calcutta and exports to foreign countries.

6.5.16. As a crash programme, formation of a Distribution Division in the Salt Commissioner's Office to deal with the day-to-day problems of the

movement of salt from the production centres to the destinations by rail, road and sea is recommended. The officers should be given adequate training in transport techniques. Computer and other modern equipments should be utilised for monitoring the movement of salt in the Salt Commissioner's Office.

6.5.17. The Working Group recommends formation of an All India Organisation, National Salt Marketing Federation, with the headquarters at Ahmedabad and branches all over India to assist the Co-operatives in the manufacture and marketing of salt. The proposed Federation will fix floor prices for the purchase of salt from small-scale manufacturers Co-operatives on the lines adopted for commercial crops like jute. The Salt Department should take a lead in the formation of the National Salt Marketing Federation in consultation with the State Governments.



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## CHAPTER VII

### MANUFACTURE OF ADEQUATE QUANTITIES OF IODISED SALT REQUIRED FOR GOITRE ENDEMIC AREAS OF THE COUNTRY AND OF IRON FORTIFIED SALT FOR THE IRON DEFICIENT POPULATION AND ITS DISTRIBUTION

#### 7.0. IODISED SALT :

7.1 Goitre is enlargement of the thyroid gland and appears as swelling at the base of the neck. It is wide-spread in India. When a large number of people living in a specified area are affected by goitre, it is called endemic goitre. According to the surveys undertaken so far by the Government of India, the areas all along the Himalayan belt, the entire North-Eastern Region, Delhi and Sikkim, parts of Uttar Pradesh, Bihar, Madhya Pradesh, Maharashtra and Gujarat have been found to be goitre endemic, affecting a total population of 120 million people. As survey progresses, more and more areas in the country are found to be goitre endemic. The problem of goitre, therefore, needs to be viewed in the context of the whole country.

7.2. DEFICIENCY OF IODINE : Deficiency of iodine in the human intake is the cause of goitre. It causes retardation of physical and mental development. The iodine deficiency disorders (IDD) include cretinism, deaf-mutism and mental deficiency. The presence of cretinism, deaf-mutes and mentally defectives plays a heavy load on the community.

7.3. PRACTICAL REMEDY : The best practical remedy is the daily consumption of iodised salt in place of common salt. The daily dietary requirement of iodine is 100 to 200 micrograms (0.1 to 0.2 milligram) which is normally drawn from the food and water. If the food contains goitrogens, the intake of iodine should be suitably increased. The ISI has laid down standard for the iodised salt. It is given below :—

IODISED SALT—IS : 7324—1973  
With Amendment on 1st April, 1982

Sodium Chloride	. . .	96% minimum
Matter insoluble in water	. . .	1% maximum
Matter soluble in water other than NaCl.	. . .	3% maximum
pH	. . .	7.5 to 8.00
Moisture	. . .	6% maximum
Iodine content	. . .	35-40 ppm
Keeping quality	. . .	The iodine content shall not be lower than 15 ppm within one year of manufacture.

Further, the Government of India, under the provisions of the PFA Act and the Rules made thereunder, have specified the iodine content of

iodised salt. According to it, the iodised salt should contain 25-35 ppm of potassium iodate at the manufacturing level and 15 ppm at the consuming level.

The Government of India are intending to amend the specifications of iodised salt under the Prevention of Food Adulteration Act/Rules; under the proposed amendment, the available iodine content shall not be less than 40 ppm at the manufacturing level and shall not be less than 15 ppm at the consumer's level.

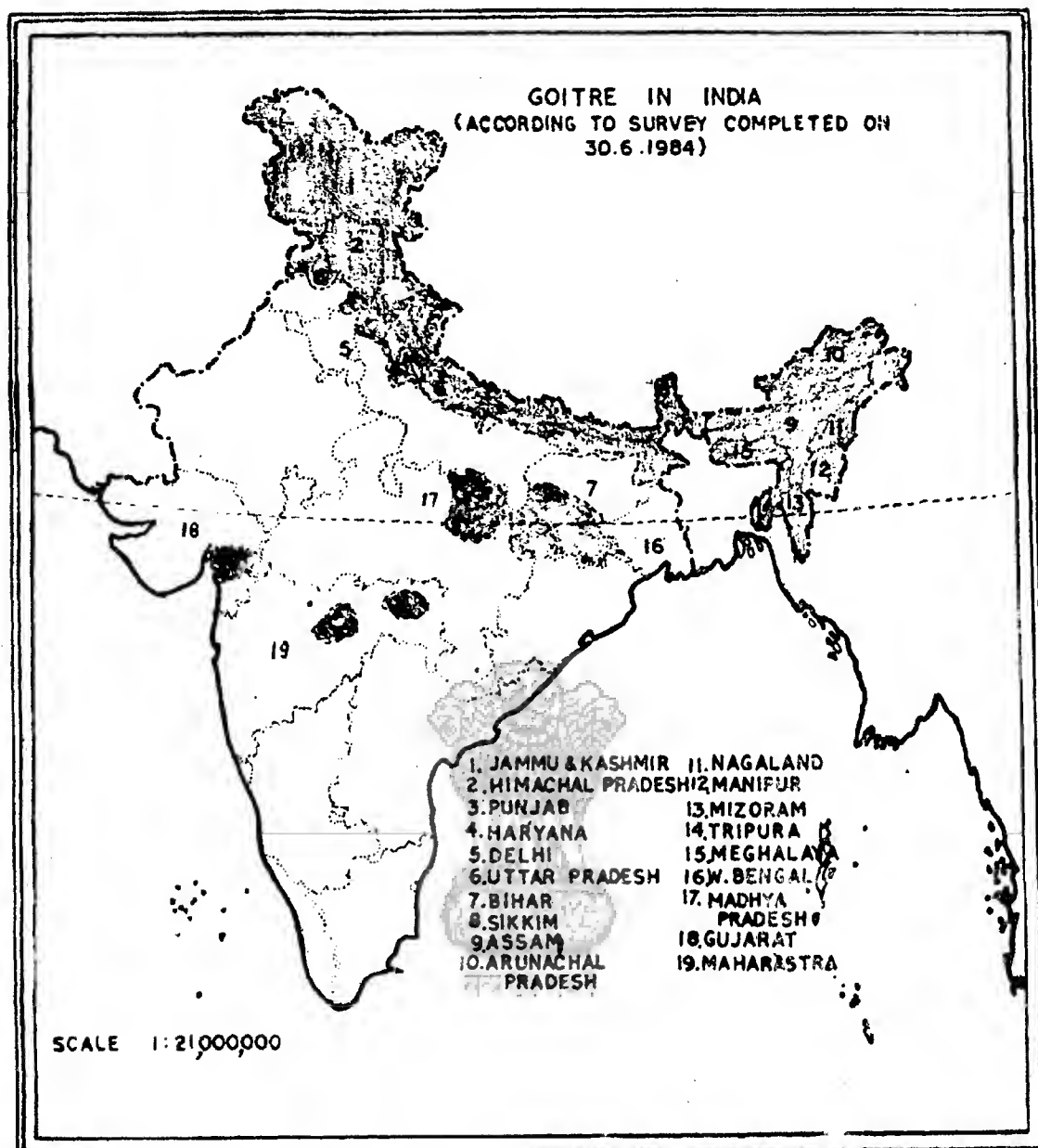
7.4. NATIONAL GOITRE CONTROL PROGRAMME : The National Goitre Control Programme, (a Central Scheme) formulated by the Government of India towards the end of the 2nd Five-Year Plan, has the following objectives :—

- (1) Survey of goitre in suspected area, to identify and assess its prevalence.
- (2) Production and supply of iodised salt to endemic areas to prevent and control the goitre;
- (3) Re-Survey after five years of continuous supply of iodised salt to assess the impact of the programme.

#### 7.5 GOITRE IN INDIA :

According to the surveys conducted (completed on 30-6-1984) by the Ministry of Health & Family Welfare, the following goitre endemic areas are to be covered for the supply of iodised salt :— (Map 3).

Jammu and Kashmir.  
Himachal Pradesh.  
Punjab (2 districts).  
Chandigarh.  
Haryana (one district).  
Delhi.  
Uttar Pradesh (20 districts).  
Bihar (8 districts).  
West Bengal (5) districts.  
Assam.  
Arunachal Pradesh.  
Nagaland.  
Manipur.  
Tripura.  
Mizoram.



BASED UPON SURVEY OF INDIA MAP WITH THE PERMISSION OF THE SURVEYOR GENERAL OF INDIA  
THE TERRITORIAL WATERS OF INDIA EXTEND INTO THE SEA TO A DISTANCE OF TWELVE NAUTICAL  
MILES MEASURED FROM THE APPROPRIATE BASE LINE

THE BOUNDARY OF MEGHALAYA SHOWN ON THIS MAP IS AS INTERPRETED FROM THE NORTH-  
EASTERN AREAS (REORGANISATION) ACT, 1971 BUT HAS YET TO BE VERIFIED

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Meghalaya.  
Sikkim.  
Madhya Pradesh (4 districts).  
Maharashtra (2 districts).  
Gujarat (one district).

The annual requirement of iodised salt for the above areas amounts to about 8 lakh tonnes.

## 7.6 CHEMICALS USED FOR IODISATION

The chemicals used for iodisation are :—

- (i) Potassium Iodide
- (ii) Potassium Iodate
- (iii) Calcium Iodate

In some countries, stabilising agents are used to prevent the loss of iodine on storage. They are Sodium Carbonate, Sodium Sulphate and Calcium Carbonate.

## 7.7 PROCESS OF IODISATION

7.7.1 The commercial production of iodised salt consists of mixing Potassium Iodate with Salt. Two processes are :—

- (i) Spray process.
- (ii) Submersion process.

The details are given below :—

### 7.7.2 SPRAY PROCESS :

In this process, an aqueous solution of Potassium Iodate (2.5 to 3 per cent) is sprayed over a layer of salt falling from the belt conveyor, in a specially designed equipment. Based on detailed studies, it is found that a uniform level of iodisation is achieved in the spray process. Plants for spray mixing are manufactured indigenously. UNICEF has supplied spray-type plants which are installed at Sambhar Lake, Kharaghoda and Howrah.

### 7.7.3 SUBMERSION PROCESS :

Central Salt & Marine Chemicals Research Institute, Bhavnagar has evolved a new technology for manufacture of iodised salt by submersion process. Common salt is immersed in a solution of saturated brine containing calculated quantity of Potassium or Calcium Iodate. After some time, salt is heaped and the liquor is allowed to drain. Thus, the salt gets coated with a thin layer of iodising chemical. Both the processes can be adopted for the manufacture of iodised salt.

## 7.8 PRODUCTION OF IODISED SALT

7.8.1 Compulsory iodisation of domestic salt is now universally recognised as the most economical, convenient and effective vehicle for the supply of iodine. The officially recommended level of iodine in iodised salt varies from 10 to 100 ppm in different countries.

7.8.2 The first commercial unit was installed at Sambhar Lake (in Rajasthan) in November, 1962. Subsequently, units were set up at Kharaghoda

(in Gujarat) and at Salkia Salt Golah (Howrah), Calcutta.

7.8.3 Details of the present installed capacity of the iodisation plants in the public sector and the production over the past 3 years are given below :—

TABLE - 14  
Production of Iodised Salt  
(in 000 tonnes)

Unit	Installed capacity on 2-shift basis	Production		
		1981	1982	1983
Sambhar . . . . .	185.4	84.1	100.2	67.3
Kharaghoda . . . . .	115.2	115.3	90.4	108.8
Calcutta . . . . .	81.0	27.8	23.2	28.0
<b>TOTAL.</b>	<b>381.6</b>	<b>227.2</b>	<b>213.8</b>	<b>204.1</b>

## 7.9 COMMERCIAL PRODUCTION OF IODISED SALT BY PRIVATE SECTOR :

7.9.1 As the requirement of iodised salt has increased year by year and it could not be met from the public sector plants alone, the Ministry of Health & Family Welfare, vide their Notification No. T-14011/5/82-PH, dated the 16th June, 1983 (Annexure-XIV) permitted the commercial production of iodised salt by the private sector. In pursuance of the above decision, the Salt Commissioner, in consultation with the Ministry of Industry, formulated the norms and procedures for permitting commercial manufacture of iodised salt in the private sector and invited application from the intending parties.

7.9.2 Salt Department has so far permitted 129 parties to manufacture iodised salt with an installed capacity of 26.35 lakh tonnes. The detailed break-up, state-wise, is given below :—

Sr. No.	Name of the State	No. of parties permitted	Capacity ('000 tonnes)
1.	Gujarat . . . . .	53	1174
2.	Rajasthan . . . . .	41	729
3.	Tamil Nadu . . . . .	19	415
4.	Andhra Pradesh . . . . .	5	71
5.	West Bengal . . . . .	2	37
6.	Orissa . . . . .	1	25
7.	Others . . . . .	8	184
<b>TOTAL . . . . .</b>		<b>129</b>	<b>2635</b>

The details and the conditions for the grant of permission for manufacture of iodised salt are given in the Annexure-XV.

## 7.10 RECOMMENDATIONS :

7.10.1 The Working Group considered the step to be taken to increase the production of iodised salt in

the country. Considering the size and population of India, partial iodisation of edible salt will not achieve the desired result of eradicating goitre. Non-iodised salt will find its way to goitre endemic areas due to various administrative difficulties involved in enforcing the ban on entry of non-iodised salt. Many countries like Canada, U.S.A., Germany, Switzerland, etc. have made iodisation of edible salt compulsory. The Working Group recommends that the *production of iodised salt should be gradually increased so that by 1990, all salt used for human consumption is iodised*. Suitable amendment will have to be done under the provision of the Prevention of Food Adulteration Act and the Rules to provide that common salt always contains the prescribed iodine content. The motto of the programme should be *Iodised Salt for All By 1990*.

7.10.2 A planned programme for increasing the production of iodised salt should be drawn by the Ministry of Industry in consultation with the Ministry of Health and Family Welfare.

7.10.3 The cost of iodisation at the source of production of salt vis-a-vis at the consuming end was studied. As it is more at the consuming end, the Working Group recommends that *iodised salt should be produced at the source of production of salt to keep the cost low*. Only in special cases, permission may be given for setting up of iodised salt plants at the consuming end.

7.10.4 Till all edible salt is iodised and made available throughout the country, iodised salt and non-iodised salt should be sold at the same price. To promote immediate increase in the availability of iodised salt, the Ministry of Health and Family Welfare should subsidize the cost of iodisation as a promotional measure for a period of 5 years upto 1989. The Industry should gradually absorb the extra cost in the process of salt manufacture itself.

7.10.5 The iodised salt should be packed at the manufacturing point in HDPE bags or jute bags lined with polythene to prevent the loss of iodine on storage and transport. It should be repacked at the consuming centres in polythene packets which should bear proper marking and labelling, showing the level of iodisation, month of production and the name of the manufacturer/packer. A slogan, 'Iodised salt for Health' may be inscribed on each bag and packet of iodised salt.

7.10.6 As iodised salt is consumed after a lapse of six to nine months from the date of its production, the Working Group recommends that the *level of iodisation should be increased to 40 ppm of iodine at the manufacturing level (present level is 15 ppm of iodine) and 15 ppm of iodine at the consuming end*.

7.10.7 As India has no source of iodine, it has to be imported. The Working Group recommends that the iodine imported for iodisation of salt should be exempted from the levy of import duty in the interest of National Goitre Control Programme.

7.10.8 CSIR, GSI and Ministry of Fertilizers and Chemicals may be requested to explore the indigen-

ous sources for iodine. In the meanwhile, Government should encourage setting up of units/plants for the conversion of imported iodine to Potassium Iodate and Calcium Iodate.

7.10.9 Iodine being a scarce chemical, research should be undertaken to find out an economical process for salt iodisation to minimise the loss of iodine on storage and consumption.

7.10.10 Salt Co-operatives produce annually 10 lakh tonnes of salt. Financial and technical assistance should be given to them by the Ministry of Industry in setting up of iodisation Plants. The Ministry of Health and Family Welfare should subsidize the cost of iodisation undertaken by the Co-operative Sector.

7.10.11 The State Governments and the State Health Departments have a vital role to play in the implementation of the National Goitre Control Programme. The Civil Supplies Department of State Governments should plan and monitor the procurement and distribution of iodised salt and make it available in the goitre affected regions. The State Governments should issue notifications banning entry of non-iodised salt into the goitre affected zones and enforce them strictly.

7.10.12 Wide publicity should be given through press, newspapers, radio and T.V. to educate the public on the use of iodised salt. The assistance of the Ministry of Information and Broadcasting and the Ministry of Social Welfare should be availed of to popularise the use of iodised and iron fortified salt.

7.10.13 Regular annual seminars and periodical workshops should be organised by the Ministry of Industry and the Ministry of Health and Family Welfare to discuss the problems of production, distribution and consumption of iodised salt.

7.10.14 The Railways should provide covered wagons for the movement of iodised salt.

7.10.15 The programme of production and distribution of iodised salt in the country should be included in the 7th Five-Year Plan and necessary financial inputs be provided.

7.10.16 The State Health Departments should be directed to enforce the provision of the PFA Act in respect of iodised salt.

7.10.17 To monitor the production and distribution of iodised salt and to enforce quality control at the manufacturing end, formation of a special cell in the Salt Department is recommended. This, coupled with the quality control laboratories to be established, should be undertaken as a crash programme.

## 7.11 IRON FORTIFIED SALT :

7.11.1 Iron deficiency anaemia is a major nutrition problem in India. The incidence of anaemia though high among women and young children, is also prevalent amongst men. Iron deficiency is due to inadequate intake of iron and/or poor absorption of iron from the diet. The simplest and easiest way to supply dietary iron is through the use of iron fortified salt. Field studies carried out with iron fortified salt in different parts of the country by National In-



stitute of Nutrition, Hyderabad. All India Institute of Hygiene and Public Health, Calcutta, Institute of Child Health & Hospital for Children, Madras and All India Institute of Medical Science, New Delhi revealed that iron deficiency anaemia can be controlled effectively by the use of iron fortified salt.

#### 7.11.2 PROCESS :

The process involves mixing ordinary salt with suitable iron compounds so that the iron content in the fortified salt is 1 mg/gram of salt. Two formulae have been developed and the both are equally effective. The National Institute of Nutrition, Hyderabad has developed '*dry mixing technology*'. Ferric orthophosphate and sodium acid sulphate are mixed in dry condition. On the other hand, the Department of Food (Salt Fortification Unit) Madras has developed '*spray mixing process*' similar to the process adopted in the manufacture of iodised salt. The chemicals used are Ferrous Sulphate, Sodium Dihydrogen phosphate and sodium acid sulphate. HDPE bags are found suitable for packing iron fortified salt and to facilitate handling in transport, 50-kg bags are advocated.

#### 7.11.3 COMMERCIAL MANUFACTURE OF FORTIFIED SALT :

The Food and Nutrition Board of the Ministry of Food and Civil Supplies has finalised the terms for the Commercial exploitation of the process and it has planned to set up three units with the assistance of the State Government and the Public Sector Salt Works.

#### 7.11.4 MARKETING AND DISTRIBUTION :

It is planned to distribute it through public distribution system (PDS), fair price shop (FPS), consu-

mer co-operatives and private retail outlets. It is recommended that iron fortified salt should also be used in the institutionalised feeding programme like Supplementary Nutrition Programme (SNP), Integrated Child Development Services (ICDS) and Mid-day Meals Programme (MDM).

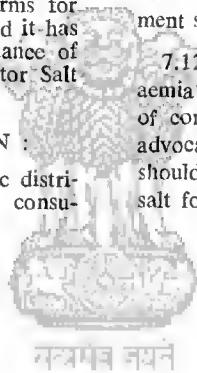
7.11.5 The cost of fortification will be 15 to 25 paise per kg of salt; this amount has to be subsidized by the Government in the initial stages. However, it will be desirable to phase it out gradually so that the consumer eventually bears this extra small financial burden, considering the beneficial effects accruing to them from the consumption of iron fortified salt.

#### 7.12 RECOMMENDATIONS :

7.12.1 Working Group considered all the aspects of iron fortification and recommended that the Ministry of Food and Civil Supply should release the process for commercial exploitation, free of royalty, and also subsidise the fortification cost in the initial, promotional period of 5 years.

7.12.2 The mass media viz. news papers, radio and T.V. should be utilised to educate the public. Ministry of Social Welfare and State Publicity Department should also be involved in it.

7.12.3 The recent medical studies reveal that anaemia and goitre are wide-spread in India. The use of common salt containing both iodine and iron is advocated in the interest of public health. Research should be undertaken to produce a new variety of salt fortified with iodine and iron.



## CHAPTER—VIII

### 8. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

8.1 The total demand of salt for human consumption and industrial purposes is estimated at about 10 million tonnes in 1990 which will raise to about 13.6 million tonnes by 2000 A.D. (Para 2.12 & 2.13)

#### 8.2 IMPROVEMENT IN SALT TECHNOLOGY :

8.2.1 The Government should take concerted measures to increase the production of various grades of salt by modernisation of the existing industry and induction of more efficient technology of production, storage and packing of salt. (Paras 3.5 & 3.16.9)

8.2.2 The Working Group recommends that the more efficient technological innovations developed abroad in Solar Salt Industry should be studied and adopted to suit Indian conditions for improving productivity and quality. (Para 3.4)

#### 8.2.3 CRASH PROGRAMME :

As a crash programme, establishment of *one Extension Centre-cum-Model salt Farm* by the Salt Department in each salt producing state is recommended. These proposed centres will act as nucleus for collection of basic scientific data, preparation of standard designs, layout plans and dissemination of improved technology, on a continuing basis. (Para 3.16.10)

8.2.4 Beaume hydrometers should be supplied to all the salt works by the Salt Department and the workers should be trained in their use in Salt manufacture. (Para 3.16.4)

#### SHORT TERM MEASURES

8.2.5 The Salt Department should take a lead in designing of a light weight semi-mechanical harvester for use in Indian Salt Industry, in consultation with the national institutions. (Para 3.16.5)

8.2.6 Design of a suitable washery to upgrade the inferior grade salt manufactured by the small scale producers is recommended. Industrial/alkali grade salt manufacturers should also instal washery of appropriate design for the production of high grade salt. (Para 3.16.6).

8.2.7 Salt Department in consultation with the Salt Manufacturers' Associations and State Governments, should initiate action on priority basis to provide basic amenities like drinking water, medical and educational facilities to salt workers. (Para 3.16.11)

#### LONG TERM MEASURES

8.2.8 Further studies on the use of dyes to increase the rate of evaporation, adoption of biological control

in salt works, and keeping the sea bars open on the East Coast are recommended. (Para 3.16.7, 3.16.8 and 3.16.12).

#### 8.3 QUALITY CONTROL

8.3.1 The existing quality control methods adopted by the Industry and the Salt Department are found inadequate. The Working Group recommends that the Salt Department and the Industry should evolve effective quality control methods to improve the quality of various grades of salt. (Para 4.12.1)

#### CRASH PROGRAMME

8.3.2 The existing Salt Testing Laboratory should be upgraded and adequately equipped immediately, to undertake the education and training of salt workers and salt manufacturers in proper design of salt works, quality control and dissemination of the latest technology. New Laboratories (Extension Centres) should be opened to cater to the needs of the localities. (Para 4.13.1)

#### SHORT TERM MEASURES

8.3.3 Salt Department in consultation with the salt manufacturers should prepare pamphlets in simple non-technical terms on 'How to produce good quality salt' and publish them in regional languages. Standard designs of salt works in different regions based on the acreage, source of brine, climate and soil conditions should be prepared and published in regional languages. (Para 4.14)

8.3.4 Salt Manufacturers, especially Salt Co-operative Societies should be granted liberal financial assistance to modernise the salt works. (Para 4.14)

#### LONG TERM MEASURES

8.3.5 Regional Design and Quality Control Laboratories should be established at Tuticorin, Kakinada, Jaipur, Dhrangadhra and Bombay to serve as regional laboratories. (Para 4.15).

#### 8.4 TRAINING

8.4.1 As there are no facilities for training in the Salt Industry, the Working Group recommends that Salt Department should organise regular training programme to meet the needs of—

- (i) skilled and semi-skilled workers,
- (ii) technicians in the industry,
- (iii) middle and top level management staff, and
- (iv) new entrepreneurs. (Para 5.2).

## CRASH PROGRAMME

8.4.2 The Salt Department should arrange :—

- (i) regular courses for the existing technicians,
- (ii) immediate training for its officers upto Superintendent's level in various aspects of salt technology, so that these officers in turn can instruct and guide the manufacturers to improve the quality of salt. All the infrastructural facilities for this purpose like provision of laboratories, books and vehicles should be made available without delay. (Para 5.7)

## LONG-TERM MEASURES

8.4.3 The Salt Department should undertake a study to improve the tools used in the industry and to devise semi-mechanical tools for use in the preparation of pans and harvesting of salt, with the assistance of NPC, CSMCRI, etc. (Para 5.9).

8.4.4 Salt Department should arrange visits of manufacturers and workers in the industry from one Region to another for exchange of ideas and techniques and also arrange an annual Get-together of salt manufacturers of various Regions. (Para 5.10)

8.4.5 A full-length educative film depicting all the steps involved in the manufacture of good quality of salt from A to Z should be produced by the Salt Department and exhibited in the various salt producing Centres. (Para 5.11)

8.4.6 The Salt Department in consultation with the CSMCRI should prepare text books for Diploma Degree courses in Salt Technology and a Monograph on Salt. (Para 5.12).

8.4.7 Pump manufacturers should be approached to design standard, high capacity, low head pumps for use in the Salt Industry. (Para 5.13)

8.4.8 Annual awards for the best workers in Salt Industry in different regions should be instituted. (Para 5.14)

8.4.9 Recovery of by-products from the bitterns should be actively encouraged. (Paras 5.15 & 5.16)

8.4.10 An All India Federation of Salt Manufacturers and Merchants' Association should be formed with the assistance of the Salt Department to promote the development of the Salt Industry in India along scientific lines. (Para 5.17)

## 8.5 MARKETING AND DISTRIBUTION OF SALT

### DISTRIBUTION

8.5.1 The Railways plays an important part in the transport of salt and by 1990, it will be called upon to move about 4 million tonnes of salt for edible and industrial purposes. (Para 6.2)

8.5.2 The Zonal Scheme formulated by the Salt Department in consultation with the Railways for the movement of salt by Rail should continue. (Para 6.2.5)

8.5.3 The Railways should freely supply wagons in piecemeal at centres where the production is not sufficient to load rakes and also permit loading of rakes made up of wagons to 2 or 3 destinations, on the same route. (Para 6.5.1)

8.5.4 The Railways should provide covered wagons for movement of salt and draw up a programme for the manufacture of sufficient covered wagons. The Railways should design "Dedicated wagons" for the movement of both iodised and non-iodised salt. (Paras 6.5.3 and 6.5.4)

8.5.5 In the interim period, the covered wagons should be supplied during the monsoon period (June to December), and if open wagons are made available, tarpaulins should be supplied by the Railways. (Para 6.5.5)

8.5.6 The Salt Department in consultation with the Salt Manufacturers' Associations, State Governments, NCCF, STATED, etc. should collect information on the facilities to be provided at the loading and unloading stations by the Railways to accelerate the movement of salt. The Railways should include them in their 7th Five-Year Plan for implementation. (Para 6.5.7)

8.5.7 The Salt Department should arrange monthly meetings with the Divisional Officers of the Railways to sort out the day-to-day problems of movement of salt by rail. Periodical meetings between the officials of the Salt Department and the Civil Supplies Department of the State Governments may be arranged to study the supply position and to sort out the difficulties in the movement of salt. (Para 6.5.8 and 6.5.9)

8.5.8 The consuming states should create salt storage dumps at suitable points near rail heads to prevent scarcity due to dislocation in the movement of salt by rail. (Para 6.5.10)

8.5.9 The State Governments should provide infrastructural facilities (like roads, jetties, etc.) at the salt works to facilitate movement of salt. (Para 6.5.11)

8.5.10 The coastal freight rate on salt should be reduced and brought at par with the rail freight, to encourage movement of salt by sea from West Coast and Tuticorin to Calcutta. Semi-mechanical loading/unloading facilities should be provided at Kandla, Tuticorin and Bombay ports in the interest of coastal salt movement and exports. (Paras 6.5.12 and 6.5.13).

8.5.11 The State Government of Andhra Pradesh should develop the port at Bhavanapadu to promote shipments of salt to Calcutta. (Para 6.5.15)

8.5.12 A "Distribution Division" should be formed in the Salt Commissioner's Office to deal with the day-to-day problems faced in the movement of salt. Computer and other modern equipments should be used in the monitoring of distribution of salt in the country. (Para 5.5.16)

### 8.5.13 MARKETING

IDBI has recognised salt industry for providing the facilities of refinance. This fact should be given

wide publicity, particularly for the benefit of the small scale and co-operative sector. The National Bank for Agriculture and Rural Development (NABARD) should be requested to take up the study of the financial requirement of the salt manufacturers and work out a suitable scheme to assist them to manufacture good quality salt. (Para 6.4.2).

8.5.14 The Salt Department should take a lead to form National Salt Marketing Federation, with Headquarters at Ahmedabad and branches all over India, to assist the co-operative sector in the manufacture and marketing of salt. (Para 6.5.17).

## 8.6 IODISED SALT

8.6.1 The problem of goitre and cretinism has to be viewed on All India basis. The use of iodised salt at the national level throughout India is recommended for the eradication of iodine deficiency disorders. (Paras 7.3 & 7.4)

8.6.2 Working Group recommends the compulsory iodisation of edible salt by 1990 and the programme of 'Iodised Salt For All by 1990' should be included in the 7th Five Year Plan of the Ministry of Health and given top-priority. Suitable amendment will have to be made to the provisions of Prevention of Food Adulteration Act and Rules to provide that edible common salt always contains the prescribed iodine content, requiring thereby compulsory iodisation of all edible salt provided in the country by 1990. (Para 7.10.1).

8.6.3 Iodised Salt should be produced at the source of production of salt to keep the cost of iodisation low. Only in special cases, iodisation plants may be located at the consuming end. (Para 7.10.3)

8.6.4 In the interim period till 1990, both non-iodised and iodised salt should be sold at the same price. To popularise the use of iodised salt, the Ministry of Health and Family Welfare should subsidise the cost of iodisation as a promotional measure upto 1989 and gradually the salt industry should absorb it in manufacturing cost of common salt. (Para 7.10.4).

8.6.5 Iodised salt should be packed in HDPE or jute bags lined with polythene, at the manufacturing end. It should be repacked at the consuming end in polythene packets of 500 gms. 1 kg. and should bear ISI certification mark. The bags and packets should be properly labelled and marked. (Para 7.10.5)

8.6.6 The Working Group recommends that the level of iodisation should be 40 ppm. of iodine at

the manufacturing level and 15 ppm. of iodine at the retail level. (Para 7.10.6)

8.6.7 The import of iodine for the manufacture of potassium iodate should continue under OGL and it should be exempted from the levy of import duty. (Para 7.10.7).

8.6.8 CSIR, GSI and Ministry of Fertilisers and Chemicals should be asked to explore the indigenous sources of iodine. (Para 7.10.8).

8.6.9 Iodine being a scarce material, research should be undertaken to refine the present process of iodisation, so that the loss of iodine on storage and transport is minimised. (Para 7.10.9)

8.6.10 Salt Co-operatives should be encouraged to set up salt iodisation units by providing technical and financial assistance. (Para 7.10.10)

8.6.11 State Governments have a vital role to play in the procurement, storage and distribution of iodised salt. They should be actively involved in the implementation of National Goitre Control Programme. The entry of non-iodised salt in goitre endemic areas should be banned by the State Governments. (Para 7.10.11).

8.6.12 Wide-publicity through newspapers, radio, T.V. etc. should be given to educate the public on the use of iodised salt. (Para 7.10.12).

8.6.13 Regular annual Seminars and periodical workshops should be organised by the Ministry of Industry and the Ministry of Health and Family Welfare to promote salt iodisation programme. (Para 7.10.13).

8.6.14 To monitor the production and distribution of iodised salt and to enforce quality control at the manufacturing end, immediate formation of a special Salt Iodisation Division in the Salt Department is recommended. (Para 7.10.17)

## 8.6.15 IRON FORTIFIED SALT

Working Group recommends that the Ministry of Food and Civil Supplies should release the process of Iron fortification for commercial exploitation free of royalty and also subsidise the cost of fortification in the initial promotional period of 5 years. (Para 7.12.1)

8.6.16 Research should be undertaken to produce a new variety of fortified salt containing both iron and iodine. (Para 7.12.3)

## ANNEXURE I

No. 07013/1/83-Salt  
Government of India  
Ministry of Industry  
(Deptt. of Industrial Development)  
New Delhi, the 4th June, 1983

### OFFICE MEMORANDUM

Subject : Working Group on improvements in Technology of salt manufacture, quality control and training.

The undersigned is directed to say that it has been decided to constitute a Working Group to look into the question of improvements in technology for salt manufacture, production of quality salt and imparting training to salt workers to achieve these objectives, consisting of the following :—

- |  |           |
|--|-----------|
| (i) Shri P. Subramanian,<br>Salt Commissioner.   | —Chairman |
| (ii) Shri J. S. Matharu,<br>Industrial Adviser,<br>DGTD, New Delhi.  | —Member   |
| (iii) Director,<br>CSMCRI, Bhavnagar.  | —Member   |
| (iv) Chairman-cum-Managing Director,<br><br>Hindustan Salts Ltd., and<br>Sambhar Salts Ltd., Jaipur.                       | —Member   |
| (v) Managing Director,<br>Mettur Chemicals & Industrial<br>Corporation, Madras.  | —Member   |
| (vi) Chairman-cum-Managing Director,<br><br>M/s. Tata Chemicals Ltd.,<br>Bombay.   | —Member   |
| (vii) President,<br>Kutch Saurashtra Salt<br>Manufacturers' Association,<br>M/s. Halar Salt & Chemical<br>Works (Gujarat). | —Member   |
| (viii) Managing Director,<br>Marthi Crystal Salt Company,<br>Madras.   | —Member   |
| (ix) Secretary,<br>Andhra Pradesh Salt<br>Producers' Association,<br>Vishakapatnam (A.P.).                                 | —Member   |

- |   |         |
|---|---------|
| (x) President,<br>Gujarat Rajya Mitha Utpadak<br>Sahakari Sangh Ltd.,<br>Surendranagar, Gujarat.                            | —Member |
| (xi) President,<br>Arumuganeri Salt Production and<br>Sales Co-operative Society.<br>Arumuganeri, Tirunelveli (Tamil Nadu). | —Member |
| (xii) A representative of the Ministry of<br>Health & Family Welfare,<br>(Deptt. of Health).                                | —Member |
| (xiii) a representative of Ministry of<br>Chemicals & Fertilizers,<br>(Deptt. of Chemicals).                                | —Member |
| (xiv) A representative of the Deptt. of<br>Industrial Development.  | —Member |

2. The Group shall undertake a study of the technology presently adopted for salt manufacture in different states, existing standard of salt produced vis-a-vis those prescribed under PFA Act, 1954 and Rules made thereunder and the training facilities presently available, and shall suggest time-bound measures for :—

- |   |
|---|
| (a) effecting improvements in technology that are feasible in different salt producing States ;   |
| (b) bringing about improvements in quality of salt produced, keeping in view the prescribed standard for edible consumption and the specific requirements of chemical industries; and |
| (c) type of training that is required to be imparted to salt workers for adopting the improvement in technology and standard of salt as indicated at (a) and (b) above.               |

3. The Group shall submit its report within a period of one month.

4. Every non-official member attending the meeting of the Group or its sub-committee shall be entitled to Travelling allowance and Daily allowance as admissible to him under the rules and orders issued by the Govt. of India from time to time. The Salt Commissioner, Jaipur will be the controlling officer for the purpose of countersigning the T.A. D.A. Bills of non-official members.

Sd/—  
O. P. SHARMA, Under Secretary,  
to the Government of India.

## ANNEXURE-II-A

No. 07013/1/83-Salt  
Government of India  
Ministry of Industry  
Deptt. of Industrial Development  
New Delhi, the 5th July, 1983

### OFFICE MEMORANDUM

Subject :—Working Group on improvements in technology of salt manufacture, quality control and training.

In continuation of this Ministry's O.M. No. 07013/1/83-Salt, dated 4-6-1983 on the subject mentioned above, the undersigned is directed to

say that Shri Onkar Sharan Mehrotra, Director, M/s. Hindustan Salts Ltd., Jaipur (6, Ojha Street, Kashipur) has been nominated as a Member of the Working Group constituted to look into the questions of improvements in technology for salt manufacture, production of quality salt and imparting training to salt workers.

Sd/-

O. P. SHARMA, Under Secretary.

Shri P. Subramanian,

Salt Commissioner & Chairman of the Working Group Post Box No. 139, Jaipur.



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ANNEXURE-II B

No. 07013/1/83-Salt  
Government of India  
Ministry of Industry

Deptt. of Industrial Development  
New Delhi, the 12th Aug. 1983

OFFICE MEMORANDUM

Subject:—Working Group on improvements in  
technology of salt manufacture, quality  
control and training.

In continuation of this Ministry's O.M. of even  
number dated 4-6-83 and 5-7-83 on the subject  
mentioned above, the undersigned is directed to  
say that the Working Group shall also study the  
following matters and make suitable recommenda-  
tions thereon:—

(i) marketing and distribution of salt; and

(ii) manufacture of adequate quantities of  
iodised salt required for Goitre endemic  
area of the country and of iron fortified  
Salt for the iron deficient population and  
its distribution.

2. The Working Group shall also have represen-  
tatives of the Ministries of Shipping & Transport,  
Railways and Food & Civil Supplies (Deptt. of  
Food).

3. The term of the Working Group has been ex-  
tended to 30-11-1983 by which date it should  
submit its report to Government.

Sd/-

S. B. GOEL, Deputy Secretary.



### ANNEXURE-III

TEXT OF ADDRESS BY SHRI NARAYAN DATT TIWARI, UNION MINISTER OF INDUSTRY AT THE MEETING OF THE WORKING GROUP ON IMPROVEMENTS IN TECHNOLOGY OF SALT MANUFACTURE, QUALITY CONTROL AND TRAINING HELD AT UD-YOG BHAVAN, NEW DELHI ON THE 22nd JULY, 1983.

Friends,

I have great pleasure in extending to you a hearty welcome to the meeting of the Working Group on improvements in Technology of Salt manufacture, quality control and training.

The art of sal making is as old as mankind. The Salt Satyagrah by Gandhiji was an important milestone in our Freedom struggle. It signified not making the resistance to laws which we had no hand in framing but also drew to be the common man in this freedom struggle because salt affects his life, his needs, more than anything else. When we attained Independence in 1947, we imported salt from Liverpool and Aden to meet our indigenous requirement. The National Government took steps to increase salt production, and as a result we became self-sufficient in this essential commodity, in 1952. Since then, we continue to manufacture enough salt to meet our requirements, both for human consumption and industrial needs, the surplus being exported. Our production has increased from 1.9 million tonnes in 1947 to 8.9 million tonnes in 1981.

India is endowed with inexhaustible natural resources of salt-sea water, sub-soil and lake brine. In the process of manufacture, we use only solar energy, we have abundant manpower, the question therefore to ask ourselves is, whether given these advantageous factor endowments has this industry progressed in the right direction in the adoption of improved technology and modern innovations? Are we the leaders and pioneers of Salt Industry in the World? The answer is unfortunately, No. While production has increased, the quality of the product has not kept pace with National and International Standards. The recent technological innovations and advancement in salt production have not made their full impact on the Indian Salt Industry.

The Salt Experts Committee of 1950 and Shri Manubhai Shah's Salt Committee of 1958 had unanimously recommended that the Salt Industry should pay attention to improve the quality of salt to meet requirements of various grades of salt for human consumption, Chlor-alkali industry, and export. The Govt. of India established the CSMCRI at Bhavnagar in 1954 with a view to assisting the Industry in improving the technology and quality of

salt. Indian Standards Institution has fixed standards for various varieties of salt namely, common has for edible purposes, Table salt, Dairy salt used for butter and cheese, industrial grade salt, salt for hide curing, salt for fish curing and iodised salt, with a view to encouraging the salt manufacturers to produce salt of the required purity. As you know, the purity of salt is measured by its percentage of Sodium Chloride content. In addition, salt for human consumption should be pure white in colour and should not contain mud, sand and clay. It is surprising that we are yet to attain the standard purity of 96% Sodium Chloride for edible salt fixed in 1951 by the ISI. The Ministry of Health and Family Welfare has recently notified under the Prevention of Food Adulteration Act that salt for edible purposes should contain 96% (Sodium Chloride) by 1-4-1985.

Salt is no longer the simple ingredient in our food, that it used to be, rather the stress is now on fortified salt in consonance with, and to achieve the goals of the National Health:

- iodised salt to prevent and control endemic Goitre, and cretinism; and
- iron fortified salt against iron deficiency anaemia.

Such is the importance of this programme that the Prime Minister herself has impressed upon us the need for undertaking manufacture the quality of fortified salts which our vast population needs. The Ministry of Health and our department have held meetings recently to work out a programme of manufacture both through the public sector and through the private sector for achieving our targets. Let me briefly mention to you the magnitude of this problem so that you can get some idea of the seriousness of the problem and the urgency with which it has to be tackled.

About 120 million people living Sub-Himalayan Region, in the States of Jammu & Kashmir, Himachal Pradesh, parts of Punjab, Haryana, Uttar Pradesh, Bihar and the North-Eastern States, are affected by Goitre. The disease is due to lack of Iodine in food. The swelling appearing at the neck due to Goitre is not merely a problem of physical deformity but rather, is a serious problem of public health, which impinges on National productivity and on the well being of the individual.

A fairly simple answer to this disease, especially its prevention, is iodised salt which should be of high purity so that Iodine is not lost during storage and transportation. Iron fortified salt is also recommended to fight Anaemia in children and women which also makes it necessary to ensure high purity and well fortified salt.



On the Industrial side, salt is an important raw material for the heavy chemical industry. The consumption of salt by Soda Ash and Caustic Soda Industries is likely to increase from 2.4 million tonnes in 1982 to about 5 million tonnes by 1990. The Chemical Industry requires high grade salt with the minimum impurities of Calcium and Magnesium. The Central Board for Prevention and Control of Water Pollution has suggested the use of high purity of salt by the Caustic Soda manufacturers to prevent Mercury pollution of the environment. The more advanced industrial countries have become extremely vigilant to the need to prevent mercury pollution and we have to exercise the same vigilance.

With our natural resources and potentialities we should have a big share of the world trade in salt, but at present due to the poor quality of our produce, we are unable to increase our exports in a big way. This should make us think as to what are the steps required to bring our salt in line with world standards of salt manufacture and also what are the steps in marketing which are required to gain a sufficient share of the world market.

The important questions before you to-day are :—

- how to modernise our tradition-bound salt industry,

- how to involve and make 10,000 salt producers in the country accept the research findings, innovations and new techniques developed by CSMCRI, Bhavanagar and in other parts of the world ;
- the nature of training required for workers of the Salt industry to increase their productivity and consequently their welfare;
- how to improve the technology of manufacture and the quality of various grades and varieties of salt;
- what is the role to be played by Govt., by the Salt Department, by the CSMCRI & by the Salt manufacturers in this national effort of making the Indian Salt Industry modern, and vibrant.

Your deliberations will have an important bearing on the future development of Salt Industry in India, and given your rich experience, may I suggest to you to work out the details of a time-bound programme and suggest measures which can be quickly implemented.

Thank you.



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ANNEXURE - IV

STATEMENT SHOWING THE TOTAL PRODUCTION OF SALT IN INDIA INCLUDING UNLICENSED  
SECTOR FROM THE YEAR 1947 TO 1983

Year	Production of Salt (in' 000 tonnes)	1	2
1947	1929.8	1964	4646.8
1948	2374.8	1965	4717.3
1949	2075.8	1966	4521.5
1950	2661.9	1967	4488.2
1951	2776.1	1968	5043.7
1952	2868.9	1969	5173.4
1953	3213.2	1970	5588.2
1954	2758.6	1971	5426.1
1955	3025.2	1972	6517.1
1956	3317.6	1973	6860.2
1957	3670.1	1974	5912.9
1958	4195.7	1975	5842.9
1959	3177.9	1976	4076.4
1960	3435.9	1977	5328.5
1961	3480.6	1978	6693.5
1962	3886.1	1979	7037.0
1963	4544.1	1980	8007.4
		1981	8923.2
		1982	7308.4
		1983	7004.8



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## ANNEXURE V

EXPORTS							
(In '000 tonnes)				1	2	3	4
	1981	1982	1983				
1	2	3	4				
(a) <i>By Sea</i>							
1. Bangla Desh . . .	59.9	192.6	290.7	9. Zanzibar . . .	...	1.6	...
2. Maldives . . .	1.0	1.0	1.3	10. Japan . . .	...	...	17.1
3. Kenya . . .	8.0	...	...	11. Hongkong . . .	...	...	16.9
4. Singapore . . .	...	...	42.8	12. Uganda . . .	...	...	7.5
5. North Korea . . .	54.1	16.9	..	Total by Sea . . .	131.4	233.7	420.2
6. Tanzania . . .	7.4	...	7.4				
7. Malaysia . . .	...	21.6	36.5	(b) <i>By Rail</i>			
8. Dubai . . .	1.0	...	...	1. Nepal . . .	95.8	94.2	64.1
				2. Bhutan . . .	2.7	2.9	2.2
				Grand Total . . .	229.9	330.8	486.5



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ANNEXURE - VI

PROJECTION OF THE DEMAND OF SALT FOR HUMAN CONSUMPTION FROM 1981 TO 2000.

Year	Population Require-				
	in millions	ment in lakh tonnes	1	2	3
1		3	1990	853.99	51.24
1981	683.81	41.03	1991	875.34	52.51
1982	700.91	42.05	1992	897.22	53.83
1983	718.43	43.11	1993	919.65	55.17
1984	736.39	44.18	1994	942.64	56.55
1985	754.80	45.29	1995	966.20	57.96
1986	773.67	46.42	1996	990.36	59.42
1987	793.01	47.42	1997	1015.12	60.90
1988	812.84	48.77	1998	1040.50	62.43
1989	833.16	49.99	1999	1066.51	63.99
			2000	1093.18	65.59

(Projections based on annual growth rate of population @ 2.5%.)



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## ANNEXURE-VII

## CHEMICAL COMPOSITIONS OF SEA WATER, LAKE BRINE AND SUB-SOIL BRINE (ON DRY BASIS)

	Sea Brine	Lake Brine			Well Brine	
		Sambhar	Khara- ghoda	Kuda (Dhran- gadhra)	Did- wana	Pach- badra
				(Percent)		
Calcium Carbonate . . . . .	0.345	...	0.060	.073	...	...
Calcium Sulphate . . . . .	3.600	...	2.120	1.961	...	2.970
Sodium Chloride . . . . .	77.785	87.480	70.800	72.342	77.190	85.660
Sodium Sulphate . . . . .	...	8.650	...	...	20.650	...
Sodium Carbonate . . . . .	...	3.870	...	...	0.600	...
Sodium Bi-carbonate . . . . .	...	...	...	...	1.560	...
Magnesium Sulphate . . . . .	4.737	...	2.313	2.320	...	9.440
Potassium Chloride . . . . .	2.465	...	2.000	1.250	...	...
Magnesium Chloride . . . . .	10.878	...	22.360	21.795	...	1.930
Magnesium Bromide . . . . .	0.217	...	0.347	0.259	...	...
	100.000	100.000	100.000	100.000	100.000	100.000



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## ANNEXURE - VIII

TYPICAL ANALYSIS OF SALT FROM SEA, INLAND LAKE & SUBSOIL BRINE  
Percent on dry basis

Name of the place	NaCl	CaSO <sub>4</sub>	MgSO <sub>4</sub>	MgCl <sub>2</sub>	Insoluble	Undetermined
SEA SALT						
<i>Andhra Pradesh</i>						
Naupada . . . . .	96.74	0.76	0.71	...	0.41	1.38
Chinnaganjam . . . . .	94.54	1.22	0.95	1.35	1.94	...
<i>Gujarat</i>						
Jamnagar . . . . .	97.50	0.72	0.54	1.16	0.08	...
Bhavnagar . . . . .	98.11	0.56	0.49	0.76	0.08	...
Dahej . . . . .	97.72	0.66	0.49	1.02	0.11	...
<i>Manarashtra</i>						
Palghar . . . . .	96.25	0.71	0.95	2.03	0.06	...
Bassein . . . . .	96.14	0.60	1.14	2.01	0.11	...
Shewa . . . . .	95.84	0.20	1.31	2.10	0.29	0.16
<i>Orissa</i>						
Ganjam . . . . .	96.24	0.93	0.33	1.37	1.13	...
Sumadi . . . . .	96.29	0.98	0.25	1.27	1.21	...
<i>Tamil Nadu</i>						
Covelong . . . . .	96.20	0.41	0.45	2.72	0.22	...
Vedaranyam . . . . .	96.91	0.33	1.46	0.76	0.54	...
Veppalodai . . . . .	97.52	0.66	0.86	0.58	0.38	...
<i>West Bengal</i>						
Contai . . . . .	96.82	0.88	0.85	1.10	0.35	...
INLAND LAKE BRINE SALT						
<i>Rajasthan</i>						
Sambhar Lake . . . . .	97.28	...	...	...	0.91	1.37* 0.44
SUB SOIL BRINE SALT						
<i>Gujarat</i>						
Kharaghoda . . . . .	97.18	0.59	1.04	0.94	0.21	...
Kuda . . . . .	97.76	0.62	0.31	0.60	0.61	0.10
<i>Rajasthan</i>						
Phalodi . . . . .	97.54	1.09	0.34	—	0.15	0.88*
Sujangarh . . . . .	96.13	0.43	1.41	...	0.18	1.85*
Didwana . . . . .	93.29	...	...	...	0.57	6.14*

\*Includes Na<sub>2</sub>SO<sub>4</sub>

## ANNEXURE IX

## STATEWISE CLIMATOLOGICAL CONDITIONS

S. No.	Climatological observations	Tamil Nadu	Gujarat	Rajasthan	Andhra Pradesh	Maharashtra	Orissa (Humma)	West Bengal (Contai)
1.	Average rainfall (Cms)	50—60	50—60	20—50	85—95	200—250	80—140	150
2.	No. of clear days/annum	180—200 (Madras/ Tuticorin)	180—260 (Dhrangadhra/ Jamnagar)	270	150—180	180	150—170	60—75
3.	Average Relative Humidity, %	62—84	40—70	Favourable	67—82	66—86	90	75—89
4.	Wind Velocity, KMPH	10—17	17—35	—do—	15	5	5	7
5.	Mean Max. Temp., C°	29—40	27—40	—do—	32—35	29—34	25—35	30—35
6.	Mean Min. Temp., C°	20—27	15—28	—do—	17—24	20—27	14—24	24—28
7.	Average yield per acre per year (in tonnes)	25—100	50—150	50	20—30	25	15	10



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# ANNEXURE - X

## ISI SPECIFICATION OF VARIOUS GRADES OF SALT

Sr. No.	Grade of Salt	Purity of Salt required %NaCl (Minimum)	Permissible limits of impurities (Maximum)	1	2	3	4
1	2	3	4				
1.	Salt for edible purpose IS 253-1970	96.00	Water insoluble 1%, Matter soluble in water other than Sodium Chloride 3%.	5.	Fish Curing IS 594-1981	98.00	Water insoluble 0.5%, Calcium and Magnesium 0.5%, Soluble Iron Comp. 10 ppm, Water soluble matter 1.5%, Copper 1 ppm.
2.	Table Salt IS 253-1970	97.00	Water insoluble 2.2%, Acid soluble 1.5%, Calcium 1.10%, Magnesium 0.10%, Sulphate 0.50%, Alkalinity 0.2%, Lead 2 ppm, Iron 50 ppm, Arsenic 1 ppm.	6.	Hide Curing IS 543-1978	97.00	Water insoluble 1%, Iron Compound 100 ppm, Water Soluble 2%, Alkalinity 0.5 ppm.
3.	Dairy Salt IS 253-1970	99.60	Water insoluble 0.03%, Calcium 0.01%, Magnesium 0.01%, Sulphate 0.30%, Alkalinity 0.10%, Lead 2 ppm, Arsenic 1 ppm, Copper 2 ppm.	7.	Iodised Salt IS 7224-1973/ 1982	96.00	Water insoluble 1%, Soluble matter other than Sodium Chloride 3.00%, Iodine 35-40 ppm.
4.	For Chemical Industry IS 797-1982 Grade - I	99.5	Water insoluble 0.05%, Calcium 0.03%, Magnesium 0.01%, Sulphate 0.20%, Iron 10 ppm.	8.	Iron fortified Salt. (No ISI certification) suggested composition	96.00	Water insoluble matter 1%, Acid (insoluble) 0.3%, Matter soluble in water 3%, Iron 850 to 1100 ppm, Phosphate 1500-2000 ppm, Magnesium (as Magnesium Chloride) 1.2%, Magnesium (as Magnesium Sulphate) 0.75%, Sulphate (Water soluble) 2.1%, Lead 2 ppm, Arsenic 1 ppm, Arsenic 1 ppm, Copper traces, pH-2 to 3.5.





# ANNEXURE—XI

Published in the Gazette of India  
Extraordinary-Part II, Section-3,  
Sub-Section (1), New Delhi,  
Friday, January 16, 1981.

MINISTRY OF HEALTH & FAMILY WELFARE  
(Deptt. of Health)

## NOTIFICATION

New Delhi, the 16th Jan., 1981

G.S.R. 23(E).—Whereas certain draft rules further to amend the Prevention of Food Adulteration Rules, 1955, were published as required by sub-section (1) of Section 23 of the Prevention of Food Adulteration Act, 1954 (37 of 1955) with the Notification of Government of India, in the Ministry of Health & Family Welfare (Deptt. of Health) No. G.S.R. 1280, dated the 28th September, 1979 at pages 2386-2387 of the Gazette of India, Part II, Section 3, Sub-Section (i) dated 20th October, 1979 for inviting objections and suggestions from all the persons likely to be affected thereby before expiry of 45 days from the date on which the copies of the Gazette of India in which the said notification was published were made available to the public :—

And whereas the copies of the said Gazette were made available to the public on the 20th October, 1979;

And whereas the objection and suggestions received from the public on the draft rules have been considered by the Central Government.

Now, therefore, in exercise of the powers conferred by sub-section (1) of Section 23 of the said Act, the Central Government after consultation with Central Committee for Food Standards hereby makes the following rules further to amend the Prevention of Food Adulteration Rules, 1955, namely ;

## RULES

1. (1) These rules may be called the Prevention of Food Adulteration (1st amendment) Rules, 1981.

(2) They shall come into force on the date of their publication in the Official Gazette, except rules 2 & 3 which shall come into force after the expiry of six months from the date of publication of these rules.

2. In the Prevention of Food Adulteration Rules, 1955, (hereafter referred to as said Rules), in rule 42 after sub-rule (U), the following shall be inserted, namely :—

“(V) Every container of package of table salt containing aluminium silicate as anti caking agent shall bear the following label, namely :—

## Table Salt

(Contains permitted anti-caking agent)

3. In rule 49 of the said rules, after sub-rule (9), the following sub-rule shall be inserted, namely :—

“(10) Table salt containing an anti caking agent shall be sold only in a package which shall bear label as specified in sub-rule (V) of rule 42”.

4. In Appendix B of the said rules, for item A. 15, the following shall be substituted, namely:—

“A. 15-Edible common salt means a crystalline solid white, pale pink, or light grey in colour free from visible contamination with clay, grit and other extraneous adulterant & impurities. It shall not contain moisture in excess of six per cent of the weight of the undried sample. The Sodium Chloride content (as NaCl) and the matter soluble in water other than Sodium Chloride on dry weight basis shall be as specified in columns (2) & (3) of the Table below against the period of validity mentioned in the corresponding entry in column (1) of the said Table. The matter insoluble in water shall not exceed 1.0 per cent by weight on dry weight basis.

TABLE

Period of validity	Minimum percentage of Sodium Chloride content as NaCl <sup>1</sup> (on dry basis)	Maximum percentage of matter soluble in water other than Sodium Chloride (on dry basis)
(1)	(2)	(3)
Upto 31-3-1982 . . . . .	94.0	5.0
From 1-4-1982 to 31-3-1983 . . . . .	94.5	4.5
From 1-4-1983 to 31-3-1984 . . . . .	95.0	4.0
From 1-4-1984 to 31-3-1985 . . . . .	95.5	3.5
From 1-4-1985 onwards . . . . .	96.0	3.0

“Provided that table salt may contain aluminium silicate as an anti-caking agent to a maximum extent of 2.0 per cent.

Provided further that the total matter insoluble in water in such cases shall not exceed 2.2 per cent and the Sodium Chloride content on dry basis shall not be less than 97.0 per cent by weight”.

[No. P-15018/3/76-PH(F&N)(PFA)]

## ANNEXURE—XII

ZONE-WISE DISTRIBUTION OF SALT TO STATE/UNION TERRITORIES ETC., BY ROAD/RAIL/SEA/WATERWAYS  
(As per Zonal Scheme 1984)

(Figures in '000 tonnes)

S. No.	State/Union Territory	Rajasthan Zone	Kharaghoda Zone	Jamnagar Zone	Bombay Zone	Madras Zone	Calcutta Zone	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1.	Bihar	71.6	34.4	204.3	96.4	101.8	...	508.5
2.	Haryana	65.1	...	16.0	...	...	...	81.1
3.	Punjab	79.8	...	25.6	...	...	...	105.4
4.	Uttar Pradesh	163.0	277.2	327.3	54.5	...	...	822.0
5.	Chandigarh	2.8	...	...	...	...	...	2.8
6.	Delhi	28.0	...	11.0	...	...	...	39.0
7.	Rajasthan	135.3	20.1	58.8	...	...	...	214.2
8.	Manipur	12.7	...	...	...	...	...	12.7
9.	Nagaland	6.7	...	...	...	...	...	6.7
10.	Arunachal Pradesh	5.3	...	...	...	...	...	5.3
11.	Jammu & Kashmir	21.6	16.1	...	...	...	...	37.7
12.	Defence	7.34	6.4	...	...	...	...	13.74
13.	Madhya Pradesh	25.2	161.3	43.5	49.7	49.0	...	328.7
14.	Gujarat	...	66.5	198.5	...	...	...	265.0
15.	Himachal Pradesh	...	26.7	...	...	...	...	26.7
16.	Maharashtra	...	16.2	42.0	323.3	15.0	...	396.5
17.	Assam	...	...	140.7	...	25.4	...	166.1
18.	Meghalaya	...	...	12.0	...	...	...	12.0
19.	Mizoram	...	...	4.0	...	...	...	4.0
20.	Tripura	...	...	17.2	...	...	...	17.2
21.	West Bengal	...	...	96.0	...	48.0	218.0	362.0
22.	Karnataka	...	...	...	54.1	180.0	...	234.1
23.	Goa, Daman & Diu	...	...	...	7.3	...	...	7.3
24.	Dadar Nagar Haveli	...	...	...	0.7	...	...	0.7
25.	Orissa	...	...	...	...	111.5	54.0	165.5
26.	Tamil Nadu	...	...	...	...	304.2	...	304.2
27.	Kerala	...	...	...	...	160.1	...	160.1
28.	Andhra Pradesh	...	...	...	37.5	289.2	...	326.7
29.	Pondicherry	...	...	...	...	3.8	...	3.8
30.	Lakshadweep	...	...	...	...	0.3	...	0.3
31.	Andaman Nicobar	...	...	...	...	1.2	...	1.2
32.	Sikkim	...	...	...	...	...	2.6	2.6
TOTAL		624.44	624.9	1196.9	623.5	1289.5	274.6	4683.84

ANNEXURE—XIII

ANNUAL DEMAND OF SALT OF 18 STATES IN  
NORTH INDIA AS PER ZONAL SCHEME 1984  
(In '000 tonnes)

1. Jammu & Kashmir . . . . .	37.7	10. Chandigarh . . . . .	2.8
2. Himachal Pradesh . . . . .	26.7	11. Manipur . . . . .	12.7
3. Punjab . . . . .	105.4	12. Nagaland . . . . .	6.7
4. Haryana . . . . .	81.1	13. Arunachal Pradesh . . . . .	5.3
5. Delhi . . . . .	39.0	14. Meghalaya . . . . .	12.0
6. Uttar Pradesh . . . . .	822.0	15. Mizoram . . . . .	4.0
7. Bihar . . . . .	508.5	16. Tripura . . . . .	17.2
8. West Bengal . . . . .	362.0	17. Sikkim . . . . .	2.6
9. Madhya Pradesh . . . . .	328.7	18. Assam . . . . .	166.1
		<b>TOTAL . . . . .</b>	<b>2540.5</b>



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ANNEXURE-XIV  
No. T-24011/5/82-PH  
Government of India  
MINISTRY OF HEALTH & FAMILY WELFARE  
(Department of Health)  
New Delhi, the 16th June, 1983

All Health Secretaries,  
for All States/Union Territories.  
Subject :—Commercial production, supply & distribution of iodised salt for Goitre Control in India.

Sir,

I am to say that Goitre is wide-spread in India. According to the surveys undertaken so far by the Government of India, the areas all along the Himalayan belt, entire north-eastern region, some areas of Maharashtra, Gujarat and Uttar Pradesh have been found to be Goitre endemic with a total population of 120 million. As survey progresses, more areas in the country are found to be Goitre endemic. The problem of Goitre need be viewed in the context of the whole country.

Deficiency of iodine in the human intake is the cause of Goitre. Goitre appears as a swelling on the front part of the neck. It causes retardation of physical and mental developments.

The best practical remedy lies in the daily consumption of iodised salt in lieu of common salt.

The standards for iodised salt as a food have been laid down by the Government under the provision of the Prevention of Food Adulteration Act and Rules made thereunder. According to these prescribed standards, the potassium iodate content in the iodised salt should be 25—35 ppm (parts per million) at the manufacturing level, it should be at least 15 ppm at the consumption level.

The commercial production of iodised salt consists of physical addition of potassium iodate to common salt by "spray" method or calcium iodate to common

salt by "submersion" method. Both these processes are simple and involve small capital investment. The cost of commercial iodisation at the source of manufacture of common salt will be nominal.

Generally speaking, commercial iodisation process involved the use of power (electricity). Industrial licence under the provision of Section-II of the industries "Development and Regulation Act, 1951" will be required for starting any undertaking for commercial production of iodised salt as a processed food, provided the daily manpower used is 50 or more, and no such licence will be necessary, if the daily manpower used in such an undertaking is less than 50.

Considering the present availability of iodised salt in the country, compared to the demand, the commercial production of it in public as well as private sectors is welcomed, subject to their maintaining the prescribed quality. A commercial manufacturer of iodised salt may adopt ISI certification of the standard of iodised salt.

The Railways give higher priority to the movement of iodised salt by railways, compared to that of common salt. The permit wagon quota under category 'B' for the movement of iodised salt. In order to be able to get this benefit, a manufacturer of iodised salt will have to enlist himself with the Salt Commissioner of the Government of India, Jaipur.

The State Governments are requested to give adequate publicity to this.

Yours faithfully,

Sd/-

(P. R. Dasgupta)

Joint Secretary (D)

# ANNEXURE-XV

## GOVERNMENT OF INDIA OFFICE OF THE SALT COMMISSIONER POST BOX NO. 139, JAIPUR

C. No. 11(10)D/81; Jaipur, Dated

To

Dear Sirs,

Subject :—Commercial manufacture of iodised salt.

With reference to your application dated——— in the prescribed form for commercial manufacture of iodised salt, you are hereby permitted to set up an iodisation plant for iodisation of common salt——— process with an annual installed capacity of——— tonnes of iodised salt at your——— plant/salt work on the following terms and conditions :—

1. The salt used for iodisation shall be of good quality containing a minimum of 96% Sodium Chloride (on dry basis) and iodised salt produced at your plant, shall conform to the standards prescribed under the Prevention of Food Adulteration Act, 1954 and the rules made thereunder. Periodical sampling and analysis of iodised salt manufactured at your plant shall be undertaken by the Salt Department at the Departmental laboratories or any other Govt. laboratory approved by the Salt Commissioner.
2. You will make suitable arrangements to set up a small chemical laboratory for the process, control and on the spot analysis of raw salt & iodised salt. You will also maintain the necessary records of analysis as prescribed by the Salt Commissioner or the authorised officer. The laboratory will be manned by a qualified chemist having adequate knowledge of chemical analysis.
3. The iodised salt produced at your plant shall be sold only in the Goitre endemic areas which will be allotted to you by the Salt Commissioner. In the case of movement of iodised salt by rail, despatches shall be made from the rail head permitted by the Salt Commissioner and indents for wagons for its movement under category 'B' will be placed after obtaining countersignature on the forwarding notes by the Salt Department Officers.
4. The iodised salt to be sold shall be packed in polythelene lined jute bags or HDPE bags and the packings shall bear a legend : (a) iodised salt; (b) name of the producer;

(c) date of production and batch No; (d) iodine content ; and (e) net weight.

5. You will submit a weekly statement to the Salt Department in the prescribed form showing : (a) the particulars of Potassium Iodate/Calcium Iodate procured, consumption, quantity held in stocks, and (b) Quantities of iodised salt produced and issued to Goitre endemic areas attached to your plant and the stocks held by you.
6. If it is found at any time that you are not able to feed the market attached to your plant or iodised salt produced by you at your plant is not of the prescribed standards, the Salt Commissioner has the right to cancel your registration and permit any other iodised salt manufacturer to feed that market.
7. You will make your own arrangements for procurement of raw salt, Potassium Iodate or Calcium Iodate & for purchase and installation of plant.
8. In case the manufacturer of iodised salt is permitted to adopt the sub-mersion process, the technical know-how and erection details may be obtained from the National Research Development Corporation, New Delhi/Central Salt & Marine Chemicals Research Institute, Bhavnagar, directly.
9. You will ensure and undertake that the iodised salt contains 15 ppm of iodine or such other level of iodisation as may be prescribed by the Ministry of Health and Family Welfare or the Directorate General of Health Services from time to time, when it is offered for sale for human consumption in the Goitre endemic areas.
10. In the case of manufacturer(s) of common salt going into production of iodised salt with the iodisation plant(s) set up in a salt work, all the Rules and Regulations under the Central Excise & Salt Act, 1944 and rules made thereunder & Salt Cess Act, 1953 and the rules made thereunder will be applicable.
11. You will ensure that the iodisation plant is set up latest by the.....
12. You will give intimation to the Salt Commissioner and Deputy Salt Commissioner/ Assistant Salt Commissioner/ Superintendent of Your region as soon as your plant is set up for inspection of the plant and the laboratory by the Salt Commissioner or any of the officers on his behalf. You shall not commence the actual production of iodised salt unless the plant and the

laboratory are inspected and approved by the Salt Commissioner or an officer authorised by him. After the plant and the laboratory are so inspected and approved, you will be registered with the Salt Commissioner for the production of iodised salt.

13. The iodisation plant so established shall be open for inspection by the Salt Commissioner or any other officer authorised by him at any time and you will rigidly carry out the instructions issued by the Inspecting Officer in regard to the proper maintenance of the prescribed records, general cleanliness, proper operation of the plant, to its full capacity and the quality of raw salt, finished products, etc.

Please acknowledge receipt of this letter and intimate the probable date by which the plant will be ready for inspection.

Yours faithfully,

Sd/-

Salt Commissioner

#### A NOTE ON PARALLEL FEEDING SYSTEM AND SERIES FEEDING SYSTEM

**Parallel Feeding System :** Here, the saturated brine is charged independently to each crystallizer laid out in line. After charging the first charge to a depth of 7.5 to 10 cms, the saturated brine is frequently irrigated to crystallizers to maintain a constant level of evaporating brine till a layer of 7 to 8 cms of salt is built up. Bittern (mother-liquor left behind) is then drained out and salt layer is broken. A fresh charge of saturated brine is let into and salt is manually raked which gives a washing effect. The salt is then heaped, drained and transported to platform.

In this system, 25.5° Be' brine is charged in the pan and it is allowed to concentrate upto 30° Be' for crystallization of salt. Simultaneously the concentration of magnesium salts goes on increasing, which reduces the evaporation rate and consequently reduces the yield of salt per acre. Secondly, due to higher concentration of magnesium in the brine adhering the salt, the quality of the harvested salt is inferior. This method though has the advantage of being simple, the salt obtained by it, has an average purity of 96 to 97 per cent NaCl. This method is being followed at present by practically all marine salt manufacturers in the country.

**Series Feeding System :** In this system, the crystallizers of similar dimensions are arranged in a series and are interconnected (Fig.). Saturated brine of 25.5° Be' is charged to the first pan and an overflow of the brine from first pan down to the last pan is maintained. Operation is similar to that of working of condensers. Thus, the density of brine progressively goes on increasing in succeeding crystallizers. Once the equilibrium is established, it is maintained by controlling feeding of first pan with saturated brine and letting out the bittern of 29.5° Be' to 30.0° Be' from the last pan continuously. The rate of feeding brine and removal of bittern has to be adjusted according to variation of the evaporation rate which varies from place to place and season to season.

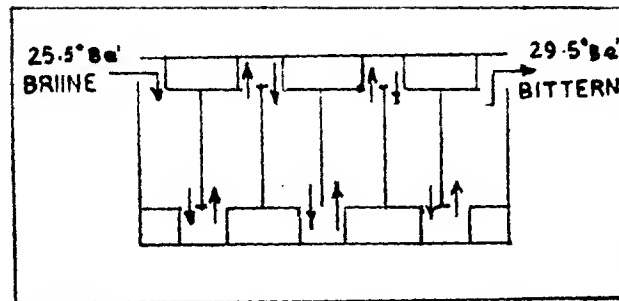
Here also a layer of 7.5 cms of salt is allowed to form in crystallizing pans prior to its harvesting. One of the advantage of this system is that while harvesting the salt, the system is not stopped as in the case of parallel feeding. The pan from which the salt is to be harvested is cut off by passing the flow to next immediate crystallizer. After harvesting of salt from the pan, it is again reconnected to the system without much disturbance. The harvesting in next pan is carried out in similar way and so on.

The density of the brine in crystallizer connected in series feeding system, slowly goes on increasing from first pan to last pan in the range of 26° to 30° Be'. Thus the salt obtained from first three crystallizers contains low magnesium impurity but little more calcium sulphate, whereas the salt obtained from last three crystallizers will have higher magnesium salts content but low calcium sulphate impurity. This can be seen from the analysis of salt given in Table.

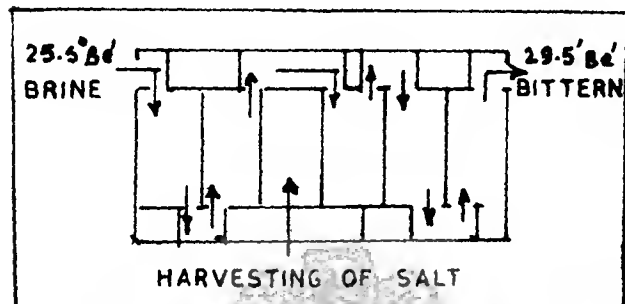
It has been observed that in case of series feeding the brine of 27.0° Be' to 27.5° Be' receives more exposure time with the result that there is an increase in evaporation and consequently the yield of salt, which has been found to be 8 to 10 per cent more than that of parallel feeding system. In series feeding system, two grades of salts are obtained. The first fraction, containing higher calcium sulphate impurity but low magnesium salt, does not require any washing and can directly be used as edible salt or for industry where calcium impurity can be tolerated. The second fraction contains higher magnesium impurity which can be easily removed by resorting to mechanical or rain-washing or washing in pans and upgraded to industrial grade salt as specified by I.S.I. 797 : 1982 grade II. This can be utilised for soda ash and caustic soda chlorine industries as well as for exports.

TABLE  
ANALYSIS OF SALT OBTAINED FROM SERIES AND PARALLEL FEEDING PANS

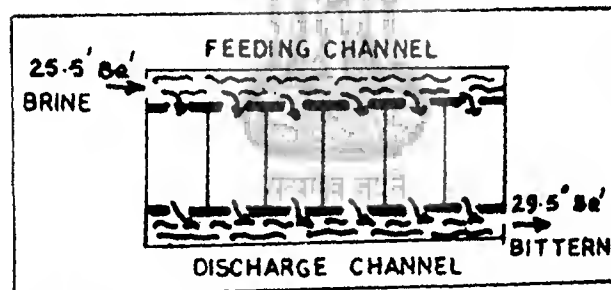
Salts	Parallel feeding pan	Series Feeding Pans					
		S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>5</sub>	S <sub>6</sub>
Ca**	0.16	0.18	0.15	0.11	0.11	0.09	0.08
Mg**	0.21	0.14	0.16	0.19	0.27	0.35	0.44
CaSO <sub>4</sub>	0.55	0.61	0.51	0.39	0.37	0.32	0.29
MgSO <sub>4</sub>	0.35	0.23	0.26	0.32	0.46	0.58	0.34
MgCl <sub>2</sub>	0.56	0.37	0.42	0.52	0.74	0.91	1.17
NaCl	98.30	98.30	98.30	98.70	98.30	98.10	97.80
Concentration range 'Be'	25.5	25.5	25.8	26.3	26.5	27.0	27.5
	to	to	to	to	to	to	to
	30.0	26.0	26.3	27.0	27.5	28.0	30.0
Quantity of salt in M.T.	620	630	700	710	715	680	665



LAYOUT OF PANS IN SERIES FEEDING



HARVESTING OF SALT IN SERIES FEEDING



LAYOUT OF PANS IN PARALLEL FEEDING

FIG: LAYOUT OF PANS IN SERIES FEEDING AND PARALLEL FEEDING

## APPENDIX-2

### PREVENTION OF IRON DEFICIENCY ANAEMIA BY THE USE OF IRON FORTIFIED SALT— A PROJECT PROPOSAL OF THE DEPARTMENT OF FOOD PRESENTED TO THE WORKING GROUP CONSTITUTED BY THE DEPARTMENT OF INDUSTRIAL DEVELOPMENT ON IMPROVEMENT IN TECHNOLOGY OF SALT MANUFACTURE, QUALITY CONTROL AND TRAINING

BY

SHRI K. S. KRISHNAMURTHY, DEPUTY TECHNICAL ADVISER, MINISTRY OF AGRICULTURE (DEPARTMENT OF FOOD),  
NEW DELHI

#### 1. INTRODUCTION

Iron deficiency anaemia is a major nutrition problem in India. The incidence of anaemia is highest among women and young children. Recent surveys indicate that, in rural India anaemia is much more widespread than hitherto believed, even among men. Iron deficiency can arise either due to inadequate intake of iron and/or iron from the habitual diets. When dietary iron absorption or poor absorption low, maintenance of iron nutrition, is not possible in many of our populations. Their diets are low in iron, presence of inhibitors like tannins and phytates are quite high and absorption promoters like Vitamin 'C' and meat are also limiting in their diets. Therefore iron availability is generally quite low. Improving bioavailability of dietary iron, involves considerable changes in the diets qualitatively and is very difficult to achieve for several reasons. Increasing the iron intake from diets usually consumed by fortification is one of the practical approaches to cover large segments of population in reasonable time at low cost. Field studies carried out with iron fortified salt in different parts of the country, permit the conclusion that, it can be a simple and effective Public Health measure to control iron deficiency anaemia.

#### 2. BRIEF SUMMARY OF MULTI-CENTRIC FIELDS TRIALS WITH IRON FORTIFIED SALT :

Institutes involved in field trials were :

- (i) National Institute of Nutrition, Hyderabad.
- (ii) All India Institute of Hygiene & Public Health, Calcutta.
- (iii) Institute of Child Health, Madras.
- (iv) All India Institute of Medical Sciences, New Delhi.

#### IMPORTANT FINDINGS/OBSERVATIONS FROM THE STUDIES ARE :

- (i) Iron fortified salt was acceptable to the consuming public in urban/rural areas.

- (ii) Had good shelf life, without developing colour, taste, even after several months of storage.
- (iii) Consumption of fortified salt showed beneficial effects by (increase in hemoglobin content and) reduction of anaemia.
- (iv) No untoward side effects were observed during 18 months of study.
- (v) Jute bags were unsuitable for packing, iron fortified salt and HDPE bags were found suitable.
- (vi) Uniformity of distribution of iron in the salt was satisfactory, depending on quality of salt (moisture and impurities), duration of blending etc.
- (vii) Enimical factors (viz.)
  - high moisture (10-12%)
  - water soluble impurities (6-7%)Result in mild yellow colouration.
- (viii) Initially, rural people did not accept crushed, fortified salt (different from crystal salt).

#### 3. CHOICE OF FORMULA AND TECHNOLOGY FOR FORTIFICATION :

Two months have been identified for fortifying salt with iron compounds and additives. (The iron content in the fortified salt is 1 mg/per gram of salt). Both the formulae are equally effective, and bioavailability is good.

Formula-I : Developed by National Institute of Nutrition, Hyderabad, is suitable for 'dry mixing technology' for adding the chemicals in powder form. Salt + Ferric Orthophosphate + Sodium Acid Sulphate.

Formula-II : Developed by Department of Food (Salt Fortification Unit), Madras, is suited for 'wet mixing process' similar to that used in the production of iodised salt. Fortificants are dissolved in small quantities of water and sprayed over salt. However, these chemicals can also be added by dry mixing. Salt + Ferrous Sulphate + Sodium Dihydrogen Phosphate + Sodium Acid Sulphate.

Formulae-II developed by (Food and Nutrition Board) is less expensive and is to be used in large scale production programme.

4. PROPOSAL OF THE DEPARTMENT OF FOOD TO PRODUCE IRON FORTIFIED SALT TO COMBAT IRON DEFICIENCY ANAEMIA : FNB has proposed to set up three large scale production units in collaboration with Central/State Government Public Sector Undertakings in a phased manner. To begin with, iron fortified salt production/distribution



will be taken up in Tamil Nadu. Some of the main features of the Project are :—

- (i) *Production, capacity and coverage* : Each unit will produce 3 tonnes/Hr. (TPH) of fortified salt.

For 250 working days ×  
20 hrs per day (4 hrs.  
will be utilised for 'main-  
tenance'). } Production  
will be  
1500  
tonnes/year

Per capital consumption of  
salt per day is 15 gms.  
(i.e. per year 5 kg.) } (Average  
figures only)

Coverage = 2 to 3 million population is one  
or two district depending upon on the dis-  
tribution of population.

*Equipments, Tools, Accessories and cost :*

- (a) Equipments for processing/fortifica-  
tion includes : SS Continuous  
Mixer (Ribben bl'ender) Sugar-  
bins, Roll crushers or Disintegra-  
tors or Pulvarisers, feed hoppers, Rs.  
swing Hammer mill, Belt and  
Bucket elevators, Belt conveyers, 5.60  
Automatic Continuous Weighers, lakhs  
Stainless Steel Areator, Air Com-  
pressor, SS Centrifugal Pumps,  
Bagging Scales etc.

- (b) Tools, miscellaneous items like Rs.  
mixing vessels. 0.12

- (c) Quality Control Labs. equip- Rs.  
ments 0.30  
lakhs

(Equipments will have contact parts made  
of either stainless steel or Fibre Glass rein-  
forced plastic).

- (ii) *Raw Materials* : Salt will be provided by  
the collaborating agencies as proposed in  
the scheme.

- (iii) Chemicals to be used should be food grade  
or I. P. grade.

(Per tonne of salt  
and cost/Kg.)

Ferrous Sulphate . . . . .	5.0 kg	Rs. 6.00
Sodium dihydrogen Phosphate . . . . .	3.5 kg	Rs. 17.00
Sodium Acid Sulphate . . . . .	3.5 kg	Rs. 6.00

The Chemicals are produced indigenously and no  
difficulty is anticipated in their availability. It may be  
expected, the cost may come down when the demand  
picks up, and production facilities are stopped up.

- (iv) *Power Consumption* : 40 HP ; consumption  
per hour is 30 units; or 600 units in 20' hrs.

- (v) *Packaging* : Ordinary gunny bags are not suit-  
able due to high acidity of iron fortified salt. HDPE  
bags are suitable for packaging iron fortified salt and  
availability poses no problems. 50 Kg capacity bags

are easy to handle, compared to 75 kg capacity and  
the extra cost involved is marginal only.

- (vi) *Marketing and distribution* :

Through : PDS—Public Distribution System

FPS—Fair Price Shop

—Consumer Cooperatives

—Private Retail Outlets.

Assistance of the State Government Departments in  
respect of PDS/FPS/Coops, will be enlisted.

Hopefully Iron fortified salt will also be used in  
the institutionalised feeding programme like (Supple-  
mentary Nutrition Programme (SNP) Integrated  
Child Development Services (ICDS) and Midday  
Meals Programmes (MDM).

- (vii) *Subsidy* : Extra expenditure due to fortifi-  
cation will be 15 to 25 paise per Kg. of salt and this  
amount has to be subsidised by the Government in  
the initial stages. However, it will be desirable to  
phase it out gradually, so that the consumer will bear  
this small but extra financial burden spontaneously,  
considering the beneficial effects, which accrue to  
them from the consumption of iron fortified salt.

- (viii) *Regulatory Aspects* : At least three param-  
eters, viz. percentage of sodium chloride (not less than  
98.5%), iron content at 850 to 1100 PPM level, mois-  
ture not more than 5% are considered critical in the  
manufacture of iron fortified salt. Standards for iron  
fortified salt have been drafted and referred to the  
authorities in the Union Ministry of Health. It is ex-  
pected that the regulatory aspects will be notified  
shortly after the same had been examined by the com-  
mittee of experts. This will facilitate the private in-  
dustry also to produce iron fortified salt for the mass  
distribution.

- (ix) *Promotion and publicity* : Marketing of iron  
fortified salt will be supported by Nutrition education  
programmes by the Union Government/State Govern-  
ments. Available mass media facilities will be uti-  
lised in the consumer education programmes. Surplus  
quantities of iron fortified salt can be sold through  
commercial channels without subsidy from the gov-  
ernment. However, there will be no ban on the  
entry of ordinary salt and educational efforts will be  
strengthened to educate community on the usefulness  
of iron fortified salt.

- (x) *Monitoring and Evaluation* : Activities inclu-  
ded are :

- Examine the quality of plain salt.
- Collect fortified salt from retail outlets and  
households to test them for quality para-  
meters.
- Rapid field tests (potassium ferro cyanide  
test).
- Surveys to assess consumer attitudes, prefer-  
ences and reaction to the fortified salt.
- Assessment of distribution logistics prob-  
lems.

- Study beneficial effects of fortified salt to the community through physico-clinical studies by National Research Laboratories.

It is essential to develop a coordinating mechanism involving the Departments of Food, concerned Union and State Government Departments, national research laboratories etc.

(xi) *Research & Development Activities :*

- To identify cheaper, efficient, biologically superior additives, absorption promoters.

- To improve technology of production.
- To achieve cost reduction
- To study product behaviour, shelf life, Packaging problems etc.

Studies are in progress at the National Institute of Nutrition, Hyderabad, on double fortification of salt with iron and Iodine for eradicating the twin public Health Problems, viz. Iron deficiency anaemia and Goitre.



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